GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

(A State University established by Govt. of NCT of Delhi)
SECTOR 16C, DWARKA, NEW DELHI-110078

CONTROLLER OF EXAMINATIONS

Ref. F. No.GGSIPU/COE-II/CET/Ph.D/WS/2025-26/ 877 Dated: 28.12.2025

NOTIFICATIONS

Notice Inviting objections (if any) with regards to Question Paper and Answer Key for PET-2025(Winter Session) Examinations held on 28/12/2025 in 1st Shift & 2nd Shift.

This is for information of all the Candidates who appeared in PET-2025 (Winter Session) examination held on 28/12/2025 (shift-I) and (Shift-II) conducted by GGSIP University, that the Question Paper & Answer Key of PET Examination held on 28/12/2025 has already been uploaded on the University's website and will remain available till **31/12/2025, 05:00 PM**. All the candidates who wish to raise objection (if any), may raise objection by sending an email to **coe2@ipu.ac.in** by paying fee of Rs.200/- per question in the account as per details given below.

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Roll No.	Candidate Name	Programme Name	CET- Code	Question Number

Dr. S.L. Bhandarkar
(Controller of Examination-II)

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1. Controller of Finance for information and necessary action.
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Correct Option is marked in bold

Q1 Planning involves dealing with

a. Aim and objective

b. Aim and subjective

c. Aim and superlative

d. None of these

Q2 Educational planning is

a. Best use of teaching

b. Best use of limited resources

c. Both 'a' and 'b'

d. None of the above

Q3 Which of the following is true about social demand approach of educational planning?

a. It helps educational planners to assess the exact number of places where institution is to be set

b. It is injustiable as it overlooks the education price factor approach

c. It is appealing in nature

d. All of the above

Q4 Which of the following approach sees the estimating the quantitative implication for the system?

a. Intra-educational extrapolation

b. Demographic project model or school mapping

c. Social demand approach or model

d. Social justice approach

Q5 Cost-effectiveness approach is also known as

a. Social demand approach

b. Rate of return approach

c. Both 'a' and 'b'

d. None of these

Q6 Curriculum Organisation used for different concepts in the same class is:

a. Vertical

b. **Horizontal**
c. Logical
d. Spiral

Q7 Which one of the following is not a component of curriculum?

a. **Design**
b. Contents
c. Objectives
d. Evaluation

Q8 Psychomotor domain deals with:

a. Feelings
b. Intellectual Abilities
c. Practical Skills
d. None of the above.

Q9 The forces that affect the development of curriculum are called:

a. **Foundations of curriculum**
b. Curriculum design
c. Curriculum evaluation
d. Elements of curriculum

Q10 A framework of action for preparing a curriculum is referred to as:

a. Curriculum foundation
b. Curriculum evaluation
c. Curriculum design
d. Curriculum context

Q11 The specific learning problems of students can be found out by:

a. Evaluation
b. Diagnosis
c. Selection
d. all of the above

Q12 Which processes ascertain the work ability of learning experiences and change in behavior?

a. Evaluation

b. Assessment

c. Formation

d. All of these

Q13 Evaluation is the process of:

a. Learning

b. Gathering and interpreting evidence on changes in behaviour

c. Gathering data

d. Progress in performance

Q14 The teacher's major contribution towards the maximum self-realization of the child is best affected through collecting:

a. Constant fulfillment of the child's needs

b. Strict control of classroom activities

c. sensitivity to pupils' needs, goals and purposes

d. Strict reinforcement of academic students

Q15 Which one is not the type of evaluation?

a. Divergent

b. Process

c. Continuous

d. Corresponded

Q16 “Education Sociology is the study of the interaction of the individual and his cultural environment”. This is the quote given by:

a. Carter

b. Comte

c. Ottoway

d. **T.P Munn**

Q17 To which type of culture do attitudes, religious beliefs and etiquettes belong to?

a. Material Culture

b. Industrial Culture

c. Intellectual Culture

d. **Non-Material Culture**

Q18 Which of the following statements is not true about the family?

a. It is an essential agency for socializing and rearing the child

b. It is the only socially recognized relationship for child bearing

c. It is an agency that introduces the child to the culture of society

d. It is the only institution of society which caters to the development of the child's personality

Q19 Communities do not exert pressures on educational system in the following way:

a. Through revolts

b. Through agitations

c. **Through legislation**

d. Debates and Discussions

Q20 A level of society made up of people similar in certain respect is known as

a. **Social class**

b. Social system

c. Social order

d. Social hierarchy

Q21 Which of the following statement is true about manpower approach to educational planning?

a. It forecast the manpower needs of the economy

b. It forecast the women power needs of the economy

c. It forecast the relationship between men and women

d. It forecast the relationship between men and animal

Q22 Perspective plan exhibit:

a. horizontal and vertical harmony

b. horizontal, vertical and symmetrical harmony

c. horizontal, vertical, symmetrical and asymmetrical harmony

d. None of the above

Q23 Social justice implies:

a. equal opportunities for development to all the people of a country

b. Unequal opportunities for development

c. Equal and unequal for rich and poor respectively

d. None of the above

Q24 Article 45 of Constitution of India states to

a. provide for free and compulsory education for all children up to age of fourteen

b. Provide for free food and shelter to the needy people

c. Both 'a' and 'b'

d. None of the above

Q25 The best educational programme is one which is according to the:

a. Ability of the child

b. need of the child

c. Interest of child

d. all of the above

Q26 In a mixed ability class, a teacher should:

a. Use only one type of teaching style

b. **Use a variety of teaching-learning methods**

c. Conduct many tests

d. Employ teacher centered learning

Q27 The best description of respecting diversity among the following is:

a. **Accepting differences among people**

b. Accepting inequality among people

c. Treating people with kindness

d. Discriminating between different people

Q28 In an inclusive classroom with diverse learners cooperative learning and peer tutoring:

a. should not be practiced

b. should be used sometimes as it promotes comparison

c. **should be actively promoted to facilitate peer acceptance**

d. should be discouraged and competition should be promoted

Q29 Visual –spatial dysfunction is a……disability.

a. Mental
b. Physical
c. Social
d. **Learning**

Q30 The full form of IED is:

a. Inclusive Education for the Disabled
b. **Integrated Education for the Disabled**
c. Integrated Education for Disabilities
d. Inclusive Education for Disabilities

Q31 What does a school Counselor do?

a. Helping students in their academic goals
b. Helping students in social and personal development
c. Helping students in their career development
d. All of the Above

Q32 Which of the following is not the type of counseling?

a. Marriage and Family Counseling
b. Mental Health Counseling
c. Substance Abuse Counseling
d. Above All are types of Counselling

Q33 The students require vocational guidance because

a. it helps in their vocational selection
b. it is futile for them
c. it helps in joining interesting vocations
d. it helps in getting the job according to one's capabilities

Q34 Guidance refers to

a. An advice provided by superior to resolve problem

b. A professional advice provided by Counselor in overcoming from personal or psychological problems

c. Both A&B

d. None of the above.

Q35 Counseling refers to

a. A Professional advice by Counselor

b. An Advice by Elder

c. Both A & B

d. All of the above.

Q36 The International Court of Justice is located in:

a. Paris

b. Geneva

c. Brussels

d. The Hague

Q37 Which of the following statements is not true about refugees:

a. They are outside their country

b. Fear of persecution

c. Absence of national protection

d. **Poverty as reason of being outside the country**

Q38 Which amendment introduced the word 'secular' in the preamble of the constitution of India:

a. 44th

b. 42nd

c. 93rd

d. 18^{th}

Q39 Fundamental duties are contained in the Constitution of India in:

a. **Part IV Article 51A**

b. Part IV Article 51B

c. Part III Article 35

d. Part III Article 45

Q40 Which of the schedules of the constitution of India given below deals with recognized languages?

a. **Schedule 8**
b. Schedule 7
c. Schedule 12
d. Schedule 9

Q41 Field trips are useful in Social Science for the:

a. Evaluation
b. Empirical evidence
c. Entertainment
d. All of these

Q42 The main problem of Social Science teaching is:

a. Conventional teaching practices
b. Lack of library facilities
c. Untrained teachers
d. All of these

Q43 Which types of teaching aids are most useful in Social Science?

a. Models
b. Museum
c. Audio-visual aids
d. Drawing equipment

Q44 _____ is a type of teaching that encourages students to play a more active role in their learning process by solving problems designed to answer a general concept or answering a series of questions.

a. Exploration approach
b. Inquiry approach
c. Lecture method
d. Expository approach

Q45 The classroom processes in Social Science help in developing

a. Knowledge
b. Skill

c. Expression

d. **All of these**

Q46 Which of the following is excluded from the domain of artificial intelligence?

a. Computer vision

b. Machine learning

c. Deep learning

d. **Text**

Q47 Which out of the following is not a skill for using ICT in Education:

a. Adaptability

b. Responsibility

c. Creativity

d. Information Management

Q48 Use of educational technology is advantageous over many other methods because:

a. It allows time for thinking

b. **It provides a wider range of sensory involvement**

c . It allows proper guidance

d. It provides scope for understanding

Q49 Full form of MOOCs is:

a. Massive Online Open Courses

b. **Massive Open Online Courses**

c. Massive Online Operational Courses

d. Massive Online Operational Contents

Q50 Learning across multiple contexts through social and content interactions using personal electronic devices is called:

a. Cooperative learning

b. Team learning

c. **M-learning**

d. None of the above

Q51 Which of the following aspects focuses more on physical dimensions?

a. Concept of development

b. Concept of growth

c. Concept of change

d. Concept of learning

Q52 Who developed the concept of group factors in intelligence?

a. Burt

b. Spearman

c. Thurston

d. Guilford

Q53 Which of the laws of learning given by Thorndike had to be revised?

a. Law of Exercise

b. Law of Readiness

c. Law of Effect

d. Law of Belongingness

Q54 Below is given a list of five types of learning indicated in a hierarchical arrangement as mentioned by Robert M. Gagne. From the code given select the correct hierarchy to show your answer.

List

(i) Signal learning

(ii) Chain learning

(iii) Rule learning

(iv) Concept learning

(v) S - R learning

Code:

a. (i), (v), (ii), (iv) and (iii)

b. (i), (ii), (iv), (v) and (iii)

c. (iii), (ii), (i), (v) and (iv)

d. (iii), (iv), (v), (i)and (ii)

Q55 For ensuring effectiveness in organizing educational programmes which areas of individual differences in students will be of optimal value?

a. Physical characteristics of students

b. Racial characteristics of students

c. psychological characteristics of students

b. Moral Characteristics of students

Q56 Which one of the following is not the basic assumption of analysis of variance (ANOVA)?

a. the population distribution should be normal.

b. there should be sampling error.

c. the sub groups under investigation should have same variability

d. all the groups drawn from the population should be randomly chosen.

Q57 With respect to historical research, the process of establishing the validity of the content is termed as:

a. content analysis

b. contingency analysis

c. external criticism

d. internal criticism

Q58 A researcher is interested to understand the cultural characteristics of tribes and for this he needs to study and analyse their language, customs, traditions, life styles, religious beliefs and practices, social relations, rules of conduct etc. so he should conduct

a. survey

b. case study

c. ethnography study

d. action research

Q59 ……is an experimental bias introduced into social experiment by reactive behaviour by the control group. Pick the correct option to fill the blank.

a. Hawthorne effect

b. John Henry effect

c. Ceiling effect

d. Clouding effect

Q60 Which one of the following is not continuous variable?

a. Gender

b. Weight

c. Time

d. Height

Q61 The most common use of ……. is to test whether an existing theory can be used to solve a problem. Pick up the option to fill the blank.

a. research question

b. hypothesis

c. content analysis

d. sampling

Q62 Pick up the incorrect statement.

a. Document analysis has little concern with the trustworthiness of documents.

b. Case study examines a social unit as a whole.

c. Ethnography is a naturalistic inquiry.

d. Phenomenology probes the structure and essence of experience of phenomena for people.

Q63 …….. is the design which is recommended for experimental research where pre-test sensitization of subjects is most likely to occur. Pick up the correct option to fill the blank.

a. Solomon Four Groups Design

b. Post-test only control group design

c. Factorial design

d. Non-equivalent control group design

Q64 A researcher wants to study the effect of multimedia on the creativity of class VI students. He/she takes one section of class VI from a school. The class is divided into two subgroups A and B by randomly allocating the students to the subgroups. To one of the subgroups i.e. A, the researcher administers the test of creativity to get pre test scores on creativity. Then treatment is administered to both the subgroups i.e. A and B. When the treatment is over, only subgroup B is post tested. The pre-test used for subgroup A is same as post-test for subgroup B. The design used by the researcher is

a. static group comparison design

b. separate sample pre-test post-test design

c. counter balanced design

d. one group pre-test post-test design.

Q65 Which one of the following is a kind of self-report instrument?

a. Questionnaire

b. Attitude scale

c. Inventory

d. Achievement test

Q66 ……. of the theoretical distribution of sample means is a measure of sampling error and is called the standard error of mean. Pick up the correct option to complete the statement.

a. Mean

b. Average deviation

c. Percentile

d. Standard deviation

Q67 The mean deviation, standard deviation and variance all assume:

a. nominal data

b. ordinal data

c. interval data

d. normal distribution

Q68 A premise of ……. is the belief that people act according to how they understand the meaning of words, things and acts in their environment. Pick up the correct option to fill the blank.

a. ethnography

b. symbolic interactionism

c. systems theory

d. ethnomethodology

Q69 Which one of the following terms is not associated with quantitative research?

a. descriptive

b. variable

c. design

d. hypotheses

Q70 For the ungrouped data 16,5,12,22,16,19,10,14,11,18,17,19 the range is

a. 5

b. 17

c. 22

d. 3

Q71 Which one of the following does not pertain to action research?

a. Flexible design is used
b. Generalization of findings is not the focus
c. It studies problem faced at grass root level
d. It applies theories and principles of education for problem solving

Q72 A paradigm has following characteristics

*humans actively construct their own meanings.

*realities are multiple, constructed and holistic.

*knower and known are interactive and inseparable.

The above paradigm is describing:

a. case study
b. naturalistic inquiry
c. historical research
d. ex-post facto research

Q73 In a skewed distribution, the peak of the curve is occupied by

a. mean
b. median
c. mode
d. standard deviation

Q74 _____ is concerned with generalising experimental effects to other environmental conditions. Select the correct option to complete the statement.

a. Ecological validity
b. Internal validity
c. Population validity
d. Reliability

Q75 Select the incorrect statement with respect to normal probability curve.

a. The curve is symmetrical around its vertical axis.
b. The curve is symptotic.
c. The height of the vertical line is maximum at the mean.

d. The point of inflexion of the curve occurs at points $\pm$ 1 standard deviation unit above & below the mean.

Q76 The Environment Protection Act, 1986 of India deals with

a. Conservation & Protection of Natural Resources

b. Ban of Plastic

c. Guiding Principles of Sustainable Development

d. Environment Impact Assessment

Q77 Which one of the following led to the establishment of UNEP?

a. UN Conference on the Human Environment

b. UN Conference on Environment and Development

c. World Summit on Sustainable Development

d. World Commission on Environment and Development

Q78 Every year, September 16 is celebrated as

a. International Biodiversity Day

b. International Ozone Day

c. International Mountain Day

d. World Ocean Day

Q79 National Environmental Policy was launched by Government of India in the year

a. 1988

b. 1992

c. 2006

d. 2015

Q80 According to WHO, noise pollution is due to the noise above

a. 60 dB

b. 65 dB

c. 70 dB

d. 72 dB

Q81 Richard Suchman developed

a. Concept Attainment Model

b. Systems Approach

c. Inquiry Training Model

d. Jurisprudential Inquiry Model

Q82 The conception of people of a society in which they differ in their views/ priorities, have legal conflict with respect to social values etc. is explored through

a. Task Analysis Theory

b. Jurisprudential Inquiry Model

c. Cognitive Constructivist Theory

d. Inquiry Training Model

Q83 Information Processing Theory was developed by

a. Shepherd

b. Sweller

c. Mayer

d. Miller

Q84 Flipped classroom is an example of

a. programmed learning

b. mastery learning

c. blended learning

d. vicarious learning

Q85 The tools that help connect known to unknown are

a. content

b. advance organizers

c. syntax

d. social system

Q86 Prof. D.P. Chattopadhyaya was the chairman of

a. Indian Association of Teacher Education

b. National Curriculum Framework for Teacher Education

c. National Commission on Teachers

d. The National Council for Teacher Education

Q87 The First Asian Conference on Teacher Education was held at

a. Maharashtra

b. Karnataka

c. Delhi

d. Tamil Nadu

Q88 The Common School System was advocated by

a. Kothari Commission

b. NPE-1986

c. PoA-1992

d. Yashpal Committee

Q89 Which one of the following recommended that pre-service and in-service components of teacher education are inseparable?

a. NCFTE-2009

b. NCF-2005

c. NPE-1968

d. NPE-1986

Q90 National Curriculum Framework for Teacher Education was developed by

a. CBSE

b. UGC

c. NCTE

d. NCERT

Q91 Nuffield Science Teaching Project was initiated in

a. UK

b. USA

c. Canada

d. Sweden

Q92 Inductive Thinking Model was given by

a. Joyce and Weil

b. William Gordan

c. Hida Taba

d. William Schutz

Q93 Mastery learning and simulation belong to the

a. information processing family

b. behavioral systems family

c. personal family

d. social family

Q94 With respect to Bloom's taxonomy of educational objectives, the levels of translation, interpretation and extrapolation are reflected in the objectives that explore

a. knowledge

b. comprehension

c. analysis

d. synthesis

Q95 The action verbs for learning outcomes like negotiate, validate, substitute, integrate etc. belong to the cognitive domain of

a. evaluation

b. analysis

c. application

d. synthesis

Q96 Which one of the following is not a type of longitudinal survey?

a. Trend studies

b. Census studies

c. Cohort studies

d. Panel studies

Q97 Which one of the following is not a requirement for employing t-test?

a. Normal distribution

b. Nominal data

c. Random sampling

d. Comparison between two means

Q98 Which one of the following is a type of probability sampling methods?

a. Incidental

b. Quota

c. Purposive

d. Systematic

Q99 The difference between statistics and parameter is called

a. sampling error

b. non-sampling error

c. degree of freedom

d. standard error

Q100 With respect to validity of experimental design, which one of the following sources of error is not related to internal validity?

a. Maturation of subjects

b. Pre-testing

c. Experimental mortality

d. Ecological validity

Correct Option is marked in bold

Q1 Which of the following parameters is the main indicator of the quality of a research journal?

a. Impact factor

b. Subscription cost of the journal

c. Average number of research papers published in a volume

d. Number of issues in one volume

Q2 If a card is drawn from pack of card. What is probability of getting an ace?

a. 1

b. 0.5

c. 0.25

d. 0.0769

Q3 Ex post facto research refers to the

a. Research conducted after the incident

b. Research conducted prior to the incident

c. Research conducted at the time of happening the incident

d. Research conducted without any set objectives

Q4 After conducting ANOVA from the data obtained from a yield trial experiment, the difference in the means of different treatments can be compared using

a. Chi square test

b. F Test

c. Duncan's Multiple Range Test

d. Z test

Q5 Which expression below is quadratic polynomial of variable x

a. $ax + b = c$

b. $qx + b = q$

c. $\boldsymbol{ax^2 + bx + c = d}$

d. $\frac{ax^2}{x^3} + bx + c = dx^2$

Q6 Among some uses of a regression line, one is to

a. determine if any x-values are outliers

b. determine if any y-values are outliers

c. estimate the change in y for a one-unit change in x

d. None of the above

Q7 In ANOVA table, F value is calculated by

a. Dividing treatment mean squares by error mean squares

b. Dividing treatment mean squares by treatment degrees of freedom

c. Dividing error mean squares with total sum of squares

d. Dividing total sum of squares with error degrees of freedom

Q8 Which of the following software is used for the detection of plagiarism in research writings?

a. Turnitin

b. EndNote

c. OMICS

d. SPSS

Q9 Solution for expression 20 log(1/100) is

a. 0.2

b. 0.2

c. 40

d. -40

Q10 Total area of normal curve is

a. Equal to mean

b. Zero

c. Unity

d. 0.5

Q11 The value of correlation coefficient "r" lies between

a. +1 and +2

b. -1 and +1

c. 0 and ∞

d. 0 and +1

Q12 Coefficient of variation is expressed as

a. independent of units

b. ratio

c. percentage

d. All of the above

Q13 Normal distribution is characterized by

a. Straight line
b. Hyperbola
c. Bell shaped curve
d. Sigmoid curve

Q14 Informed consent is an essential component of

a. Human medical research
b. Market surveys
c. Historical research
d. Marine research

Q15 F, t, and $\chi 2$ represent

a. Sampling distribution
b. Asymmetric distribution
c. Discrete distribution
d. None of these

Q16 Which section of a journal article is generally available in most online databases

a. Introduction
b. Abstract
c. Methodology
d. Conclusions

Q17 If Arithmetic mean is AM, geometric mean is GM and Harmonic mean is HM, then

a. GM=AM+HM
b. AM>GM>HM
c. HM>GM>AM
d. GM=AM/HM

Q18 Type I error occurs when

a. a null hypothesis is rejected but should not be rejected
b. a null hypothesis is not rejected but should be rejected.
c. a test statistic is incorrect.
d. a test statistic is either incorrect or incorrect

Q19 If A and B are two set in universe set, which of following expression is false

a. A - (B U C) = (A – B) ∩ (A – C)

b. A - (B ∩ C) = (A – B) U (A – C)

c. (A U B)' = A' U B'

d. All of above

Q20 Test of goodness of fit is based on

a. Chi-square distribution

b. 't' distribution

c. F distribution

d. None of these

Q21 Geometric mean (G) has the expression for values a1, a2, a3……..an

a. $\frac{a1+a2+a3.....an}{n}$

b. $\sqrt[n]{a1.a2.a3\ldots..an}$

c. $\frac{n}{\frac{1}{a1}+\frac{1}{a2}+\frac{1}{a3}+\cdots...+\frac{1}{an}}$

d. $\sqrt{\frac{n}{\frac{1}{a1}+\frac{1}{a2}+\frac{1}{a3}+\cdots...+\frac{1}{an}}}$

Q22 Which of the following databases you will search for literature on a biotechnology research topic

a. PubMed

b. SNP

c. EST

d. BLAST

Q23 Selecting the significance level α will determine

a. the probability of a Type II error.

b. the probability of a Type I error

c. the power.

d. Both probability of Type I and Type II error

Q24 Following variables have been studied during an experiment. Which one of the following variables is not categorical?

a. Age of a cell culture in days

b. ploidy of cell: haploid or diploid.

c. Stage of cell division: G1, S, G2 , M phase

d. None of above

Q25 What is one of the distinctions between a population parameter and a sample statistic?

a. A population parameter is only based on conceptual measurements, but a sample statistic is based on a combination of real and conceptual measurements

b. A sample statistic changes each time you try to measure it, but a population parameter remains fixed

c. A population parameter changes each time you try to measure it, but a sample statistic remains fixed across samples

d. The true value of a sample statistic can never be known but the true value of a population parameter can be known

Q26 Arrange the following steps of research in the correct order

1. Identification of research objectives
2. Collection of data
3. Methodology
4. Results and discussion
5. Data analysis

a. 2 – 1 - 4 -3 - 5

b. 1 – 3 – 2 - 5 - 4

c. 1 – 2 – 3 - 4 – 5

d. 1 – 2 – 3 – 5 – 4

Q27 Which of the following is the main objective of research?

a. Getting an academic degree for employment

b. Review of literature on an interesting topic

c. Summarization of the work done by a scholar

d. Discovery of new facts or to make new interpretation of already known facts

Q28 Which of the following experimental design is used in agricultural research

a. Randomized Complete Block Design

b. Completely Randomized Design

c. Latin Square Design

d. All of the above

Q29 Which of the following expression is used to indicate two or more successive footnotes that refer to the same work

a. *et al*.

b. ibid

c. op. cit:

d. None of the above

Q30 The main aim of a conference is to

a. Provide a platform for presenting new research by multiple groups on predefined themes

b. Training of new research techniques to a small target group

c. Invited lectures by experts on special topics

d. All of the above

Q31 Select the correct expansion of 'NCBI'

a. National Center for Biotechnology Information

b. National Center for Biology Informatics

c. National Consortium for Biotechnology Industry

d. National Consortium for Biotechnology in India

Q32 In India, which of the following committees concerns with development and release of Genetically Modified Organisms (GMOs)

a. IBSC

b. RCGM

c. GEAC

d. All of the above

Q33 How many key-words are generally provided to give relevant information about a research paper?

a. Only one

b. One to two

c. Four to six

d. More than ten

Q34 Which of the following methods are used for graphical representation of data

a. Pie diagrams

b. Histograms

c. Frequency polygons

d. All of the above

Q35 What is probability of getting heads on both coins, if two coins are tossed together once.

a. 1
b. 0.75
c. 0.5
d. 0.25

Q36 Which of the following statistical test is to be followed for $n \leq 30$?

a. z-test
b. t-test
c. ANCOVA
d. ANOVA

Q37 The area under rejection region of a normal distribution is ……than in the t-distribution.

a. Equal than
b. Greater than
c. Lesser than
d. No relation

Q38 Among the following, select the one which is not a type of probability sampling method

a. Systemic
b. Clustered
c. Stratified
d. Non-random

Q39 Among the following, select the one which is a measure of variability

a. Range
b. Non-percentile
c. Variance
d. Correlation

Q40 Among the following, select the one which is indicative of the values attained by spearman's rank order correlation coefficient (ρ)

a. -1
b. 0
c. +1
d. All of the above

Q41 Select the statistical test suitable for ≥ 3 sample types, with one or 2 independent variable

a. ANOVA
b. Krueskal-Wallis test
c. Randomized Block Design
d. All of the above

Q42 Select the methods suitable for graphical representation of statistical data

a. Line graphs
b. Bar graphs
c. Pie Charts
d. All of the above

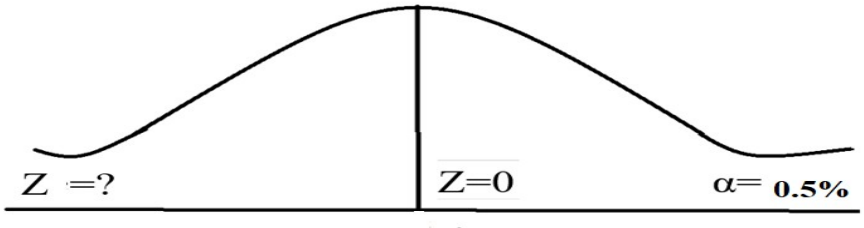
Q43 Among the following select the assumptions found true for the parametric tests

a. Normal distribution
b. Large sample size
c. Large population size
d. both a. and b.

Q44 Among the following select non-parametric tests

a. $\chi 2$ test
b. Medium test
c. Mann Whitney U test
d. All of the above

Q45 Find the value of z.



a. +1.96
b. -1.96
c. +1.95
d. both a and b

.

Q46 Which of the following is the first step in starting the research process

a. Survey of relevant literature

b. Identification of the problem

c. Identification of sources of information

d. Searching solution of the problem

Q47 Which of the following is NOT covered under "Intellectual Property Rights"

a. Patent

b. Copy right

c. Trade mark

d. Dictionary

Q48 The objectives of research involve

a. Identifying a problem

b. Finding solution of the problem

c. Both a and b

d. None of the above

Q49 Complete enumeration of statistical problem is based on

a. Few population units

b. Whole Universe

c. A small sample

d. None of these

Q50 Total area of normal curve is

a. Equal to mean

b. Zero

c. Unity

d. 0.5

Q51 Pyrimidine dimers formed due to exposure to UV rays can be repaired without removing any nucleotide by which repair mechanism

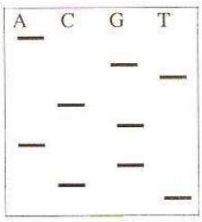
a. SOS repair

b. Mismatch repair

c. Photoactivation

d. Base excision repair

Q52 Shown here is the autoradiogram of an electrophoresis gel obtained during sequencing of a single stranded DNA by Sanger's method



The sequence of the DNA is

a. 5' TCAGCTCGA 3'
b. 3' TCAGCTCGA 5'
c. 5' AGTCGAGCT 3'
d. 3' AGTCGAGCT 5'

Q53 DNA fragmentation is a characteristic feature of

a. Cancer growth
b. Mutation
c. Cell division
d. Cell death

Q54 Most probable amino acid seen at the bents and turns of polypeptide is

a. Histidine
b. Proline
c. Tryptophan
d. Phenyl alanine

Q55 Viruses have an overall structure that is

a. Spherical
b. Isometric
c. Icosahedron
d. All of the above

Q56 You want to test the hypothesis that certain cells express both a full-length mRNA and an alternatively spliced form lacking the 1st exon. Which of the following method(s) would you use to prove the hypothesis?

a. Southern hybridization
b. Northern hybridization
c. Northwestern
d. All of the above

Q57 Toll-like receptors are part of

a. Viral entry receptors
b. Innate immunity
c. Adaptive immunity
d. Protein degradation pathway

Q58 What is the normal role of restriction endonucleases in bacterial cells?

a. To degrade the bacterial chromosome into small pieces during replication
b. To degrade invading phage DNA
c. To produce primers for replication
d. To help in cloning of DNA fragments

Q59 Most uncommon amino acid found in protein is

a. Histidine
b. Proline
c. Tryptophan
d. Phenyl alanine

Q60 Approximate molecular weight of an amino acid in a protein is

a. 128
b. 138
c. 110
d. 120

Q61 In which of the following phase of bacterial growth, secondary metabolites are produced?

a. Lag phase
b. Log/Exponential phase
c. Stationary phase
d. Death phase

Q62 Name the cytokines, which is released in response to virus infection?

a. Interferons
b. Monokines
c. Lymphokines
d. Interleukins

Q63 Where does the B-cells originate?

a. Pancreas
b. Liver
c. Thymus
d. Bone marrow

Q64 Major Histocompatibility Complex is a tight cluster of linked

a. Carbohydrates
b. Genes
c. Proteins
d. Lipid molecules

Q65 Hybridoma technology is used to produce

a. Interferons
b. Humanized antibodies
c. Monoclonal antibodies
d. Immune response

Q66 The stage when cancerous cells migrate from the site of origin to other part of the body forming secondary tumors is called

a. Proliferation
b. Diapedesis
c. Apoptosis
d. Metastasis

Q67 Which of the following is the genome of SARS-CoV-2?

a. dsRNA
b. dsDNA
c. ssDNA
d. ssRNA

Q68 Which of the following methods can be used to determine virus structures

a. Electron microscopy
b. X-ray Crystallography
c. Atomic force microscopy
d. All of the above

Q69 The process of producing a virus, which causes a reduced amount of disease for use as a live vaccine is called

a. attenuation

b. avirulent

c. virulent

d. adjuvant

Q70 Which of the following is used as a solidifying agent for media?

a. Yeast extract

b. Tryptone

c. Agar

d. Acrylamide

Q71 Gene Y was amplified from two different genomic DNA samples, A and B, and was subsequently digested with *Bam* HI. Upon complete digestion with *Bam* HI, three bands of 1 Kb, 3 Kb and 0.5 Kb were obtained in sample A. In comparison, three bands of 1 Kb, 2Kb and 0.5 Kb were obtained in sample B.

a. Gene Y in both samples has two sites for *Bam* HI.

b. Gene Y in sample A has two sites for *Bam* HI, and three sites for *Bam* HI are present in gene Y of sample B.

c. The gene Y in sample A has three sites for *Bam* HI, while the gene Y in sample B has two sites for *Bam* HI.

d. Gene Y in both samples has three sites for *Bam* HI.

Q72 'Kozak sequence' is present in-

a. Prokaryotic mRNA

b. Eukaryotic rRNA

c. Eukaryotic mRNA

d. Eukaryotic tRNA

Q73 The Catabolite Activator Protein is a –

a. Positive regulator of the Lac operon

b. Negative regulator of the Lac operon.

c. Positive regulator of the Trp operon.

d. Negative regulator of the Trp operon.

Q74 A specific gene was amplified from two different samples, A and B, using qRT-PCR. The Ct value in sample A was 15, while it was 25 in sample B. This observation most likely suggests which one of the following?

a. The gene was expressed at a higher level in sample A than sample B.

b. The gene was expressed at a higher level in sample B than sample A.
c. The gene is expressed at the same level in both samples.
d. There is no correlation between gene expression and Ct value

Q75 RNA polymerase IV enzyme synthesizes which of the following?

a. mRNA in plants
b. tRNA in E. coli
c. Small interfering RNA in plants
d. Small interfering RNA in all eukaryotes

Q76 The transcriptome of a cell is defined as:

a. The ribosomal RNA molecules present in a cell
b. All the RNA molecules present in a cell
c. The protein-coding RNA molecules
d. The transfer RNA molecules present in a cell

Q77 Microinjection

a. Delivering DNA fragment of interest into the nucleus using a fine pipette
b. Delivering DNA fragment of interest in the cell by heat shock method
c. Delivering DNA fragment of interest in the cell by giving electric shock
d. Delivering DNA fragment of interest by Calcium Chloride method

Q78 Which of the following nucleotide triplets defines a translational start codon in eukaryotes?

a. 5’ AAG 3’
b. 5’ AAA 3’
c. 5’ UAG 3’
d. 5’AUG 3’

Q79 Transgenic plants are

a. Plants with modified traits
b. Plants that contain a foreign gene of interest
c. Plants having a transgene
d. All of the above

Q80 Spontaneous mutations arise from which of the following?

a. Chemical mutagens
b. Errors in DNA replication

c. Heat

d. Radiation

Q81 Dual culture is a technique for:

a. Producing virus free plants

b. Micro-propagation

c. Producing secondary metabolites in cultures

d. None of the above

Q82 Ethylene is a:

a. Growth hormone

b. Gas

c. Causes senescence

d. All of the above

Q83 Soma-clonal variations are:

a. Not heritable

b. Are not useful

c. Seen in in-vitro regenerants from somatic explants

d. All of the above

Q84 Meristem culture is ideal for:

a. Micropropagation of endemics

b. Production of virus free plants

c. Clonal propagation

d. None of the above

Q85 The best uses of haploid production are for:

a. Pure line production

b. Dihaploid production

c. Utilization of gametoclonal variations

d. All of the above

Q86 A protein has three domains P, Q and R. Another protein has three domains R, S and Q in that order. The preferred alignment for these two proteins would be

a. Local alignment

b. Global alignment

c. Both alignments will give the same results

d. None of the methods may be suitable in this case

Q87 How many edges meet at every branch node of a phylogenetic tree?

a. 4

b. 3

c. 2

d. 1

Q88 Which one of the following correctly specifies the order of the helices according to their radius?

a. pi helix > alpha helix > 310 helix

b. 310 helix> alpha helix > pi helix

c. 310 helix> pi helix > alpha helix

d. alpha helix > 310 helix > pi helix

Q89 Molecular dynamics differs from molecular mechanics by taking account of the

a. velocities of the constituent particles

b. effect of the solvent medium

c. non-bonded interactions

d. periodic boundary conditions

Q90 Multiple sequence alignments are NOT used to derive

a. motifs

b. Primers

c. PSSMs

d. HMMs

Q91 Which of the cell junctions listed below involves adhesion to laminin?

a. tight junction

b. zonula adherens

c. hemi-desmosome

d. desmosome

Q92 Which of the cell junctions listed below facilitates the electrical coupling of cardiac muscle cells so that they contract in unison?

a. tight junction

b. gap junction

c. Desmosome

d. hemi-desmosome

Q93 Transport of soluble proteins greater than ~9 nm diameter into the nucleoplasm occurs:

a. via a diaphragm-like opening of a pore in the nuclear membrane.

b. through a mechanism identical to the insertion of large proteins into the lumen of the rough endoplasmic reticulum.

c. while the nuclear membrane is dissociated during mitosis.

d. by conformational changes that reduce the diameter of the protein to less than 9 nm.

Q94 Which of the above is the only DNA sequence required for chromosomal migration during mitosis?

a. Centrosome

b. Centromere

c. Telomeres

d. Kinetochore

Q95 Colchicine treatment of cells is used for karyotype analyses. Its mechanism of action is to depolymerize spindle microtubules and thus:

a. arrest mitosis during the relatively long period of prophase.

b. prevent inactivation of MPF, and hence block mitosis in metaphase.

c. arrest mitosis during cytokinesis.

d. activate MPF, and hence allow all the cells to leave interphase and enter mitosis.

Q96 A gel filtration chromatography is done to resolve protein mixtures of various sizes using G10 sepharose matrix. Mixture comprises of six peptides of sizes 0.3kDa, 0.5 kda, 0.7kda, 2kDa, 5kDa, 10kDa. How many peaks are expected

a. 6

b. 4

c. 3

d. 2

Q97 What will be value free energy change ΔG at equilibrium

a. Greater than 1

b. Less than 1

c. Equals to zero

d. All of above

Q98 Rate expression $dx/dt=r=k.x$ denotes that rate of reaction is

a. zero order

b. first order

c. second order

d. Multiple order

Q99 For aerobic bacterial culture, what type of impeller should be preferred

a. Anchor

b. Marine propeller

c. Paddle

d. Rushton Turbine

Q100 A protein solution after 100 fold dilution gave an absorbance of 0.5 in 1 cm path length cuvette at 280 nm. Its molar extinction coefficient is 55000 M-1 cm-1. Find out the approximate concentration of stock solution.

a. 0.91 M

b. 0.91 mM

c. 9.9 mM

d. 91mM

Correct Option is marked in bold

Q1 Which of the following is a combination of chromophore and auxochrome

a. Amine, Nitro
b. Nitro, Phenol
c. Azo, Nitro
d. Amine, Phenol

Q2 In ^{1}HNMR of CH_3CH_2Br the deshielding of methylene protons occur due to the presence of

a. Inductive effect of methyl groups
b. Electronegativity of bromine
c. +I effect of Br
d. None of the above

Q3 Cyclohexanone and cyclohexanol can be differentiated via _____spectroscopy showing peaks.

a. Vibration
b. Rotational
c. NMR
d. Both A & C

Q4 The spectroscopic study of an organic compound is done for

a. identification of structure
b. determination of purity
c. both A & B
d. determination of its physical properties

Q5 The $KMnO_4$is purple in colour as it absorbs _____ light of wavelength _____nm.

a. Yellow, 570
b. Violet, 450
c. Red, 620
d. Green, 520

Q6 Which of the following is not coming under principles of research ethics?

a. Manipulation

b. Autonomy

c. Honesty

d. Integrity

Q7 Which of the following software is used to check plagiarism?

a. Ithenticate

b. Turnitin

c. Python

d. Both A & B

Q8 IR-active vibrational modes of CO_2 is/are

a. Symmetric stretch

b. Asymmetric stretch

c. Bending

d. Both B &C

Q9 The instrument in which if ^{1}HNMR operates at 300 MHz then its ^{13}CNMR resonating frequency is

a. 100 MHz

b. 75 MHz

c. 60 MHz

d. 95 MHz

Q10 Which of the following is/are type of Mass spectroscopy

a. FAB

b. HRMS

c. TMS

d. Both of A & B

Q11 X Rays as compared to ultraviolet (UV) light, their wavelength is _____, whereas gamma rays have a _____ wavelength

a. Longer, shorter

b. Longer, longer

c. Shorter, longer

d. Shorter, Shorter

Q12 Which type transition is forbidden in UV-visible spectroscopy

a. $\sigma \rightarrow \sigma^*$

b. $n \rightarrow \pi$

c. $\pi \rightarrow \pi^*$

d. both A & C

Q13 The approximate value of chemical shift for aliphatic protons in NMR is

a. 1.2

b. 4.0

c. 7.5

d. 8.5

Q14 The property of a compound required to record its Gas chromatography mass spectrometry (GC/MS):

a. Volatility

b. Crystallinity

c. Amorphous nature

d. hygroscopic nature

Q15 In a chemistry laboratory we should use

a. Safety glasses

b. Gloves

c. Lab Coats

d. All of the above

Q16 What is not eligible for copyright?

a. Books

b. Music

c. Some variations of typographic ornamentation

d. Painting

Q17 We placed cards marked from 2 to 101 in a box and then mixed thoroughly. If we draw one card out of the box, what would be the probability that this number is a perfect cube?

a. 1/100
b. **3/100**
c. 3/101
d. 3/99

Q18 If we throw two dice simultaneously, what would be the probability that we get a 10 or 11?

a. **5/36**
b. 5/12
c. 1/7
d. 1/3

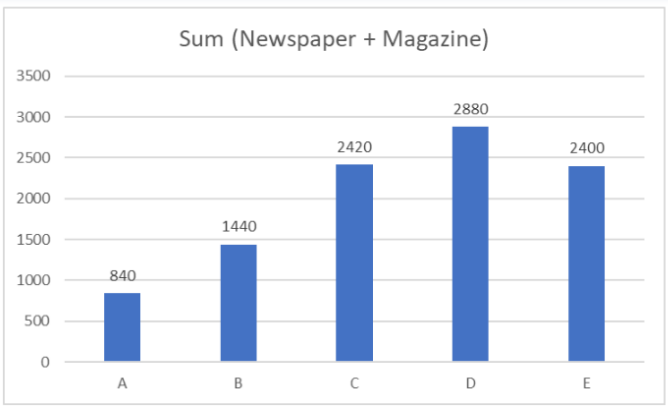
Q19 Which of these does not refer to a normal distribution's characteristics?

a. It is a type of bell-shaped distribution
b. The mean, mode and median are equal to each other
c. **The mean will always be zero**
d. It is a symmetrical type of distribution

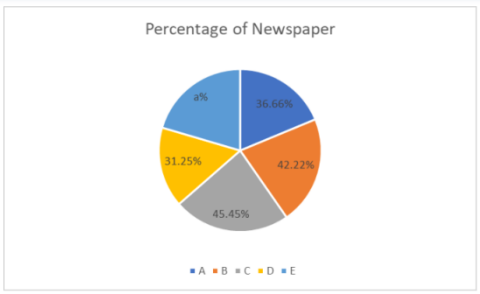
Q20 The Chi-Square test is primarily used for which type of data ?

a. Nominal or Categorical Data
b. Ordinal Data
c. Interval Data
d. Continuous data

Q21 The bar graph shows the total number of newspaper and magazines sold by five organizations (A, B, C, D, E):



The pie chart shows the percentage of newspapers sold by each organization.



What is the total number of Magazine sold by E:

a. 1500

b. 1440

c. 900

d. 600

Q22 Which of the following values is used as a summary measure for a sample, such as a sample mean?

a. Population parameter

b. Sample parameter

c. Sample statistic

d. Population mean

Q23 The method of _____ is the most appropriate method to fit a unique curve from the given data.

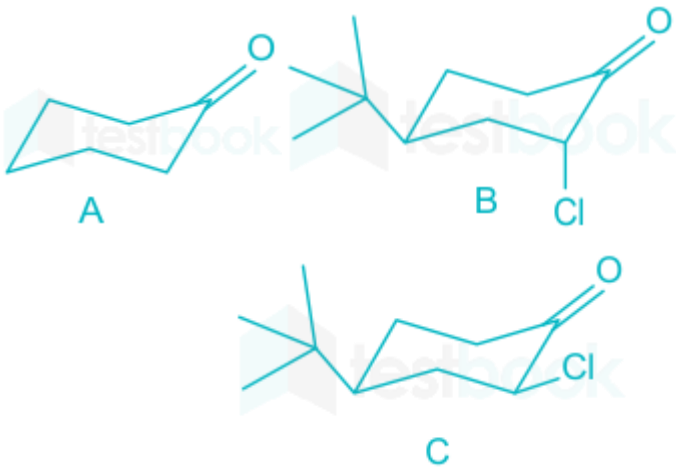
a. Squares of square

b. Sum of square

c. Least square

d. None of these

Q24



a. A > C > B

b. B > C > A

c. **C > B > A**

d. B > A > C

Q25 Intense band generally observed for a carbonyl group in the IR spectrum is due to

a. The force constant of CO bond is large

b. The force constant of CO bond is small

c. There is no change in dipole moment for CO bond stretching

d. The dipole moment change due to CO bond stretching is large

Q26 The frequency shift of the carbonyl absorption in the cyclohexane carboxaldehyde is -

a. 1600 cm^{-1}

b. 1700 cm^{-1}

c. 1835 cm^{-1}

d. **1730 cm^{-1}**

Q27 The peaks in the 320-380 nm portion of the UV absorption spectrum of pyridine shift toward the blue portion of the spectrum when the solvent changes from hexane to methanol. This phenomenon can be attributed to:

a. The increase in the energy of the π-orbital due to the change in solvent.

b. The decrease in the energy of the n and π* orbitals, with the n orbital experiencing a greater decrease, leading to a hypsochromic shift.

c. The interaction between π-orbitals of pyridine and the non-polar nature of methanol.

d. The formation of hydrogen bonds between hexane and the nitrogen atom in pyridine.

Q28 In the UV-visible absorption spectrum of an α, β-unsaturated carbonyl compound, with increasing solvent polarity,

a. n-π* transitions undergo hypsochromic shift, π-π* undergo bathochromic shift

b. n-π* transitions undergo bathochromic shift, π-π* undergo hypsochromic shift

c. both n-π* and π-π* transitions undergo bathochromic shift

d. both n-π* and π-π* transitions undergo hypsochromic shift

Q29 Using a double beam UV-visible spectrophotometer, Beer's law fails for K2Cr2O7 solution when

a. intensity of light source is changed

b. detector is not a photomultiplier tube

c. cuvette of 2 cm size is used

d. pH is not kept same in all measurements

Q30 Which of the compound show only one signal is present in the PMR spectra?

a. C_3H_4, C_3H_6

b. C_4H_6, C_5H_{12}

c. C_8H_{18}, C_2H_6O

d. All of the mentioned

Q31 How many Hertz does 1 ppm correspond to for an PMR spectrometer operating at a radio frequency of 60 MHz and 100 MHz?

a. 6 Hz, 10 Hz

b. 60 Hz, 100 Hz

c. 100 Hz, 60 Hz

d. 10Hz, 100Hz

Q32 The distance between the centers of the peaks of doublet is called as?

a. Coupling constant

b. Spin constant

c. Spin-spin coupling

d. Chemical shift

Q33 The technique SEM stands for

a. Silent Electric Magnetism

b. Scanning Electric Magnetism

c. Scanning Electron Microscopy

d. Silent Electron Microscopy

Q34 What should you do if you accidentally ingest a toxic chemical?

a. Induce vomiting immediately

b. Ignore it and continue working

c. Rinse your mouth with water

d. Seek immediate medical attention

Q35 What does the acronym HAZCOM stand for in chemical safety?

a. Hazardous Communication

b. Handling Chemical Compounds

c. Health and Safety Compliance

d. Hazardous Material Composition

Q36 The first NMR machine was made by

a. Watson and Crick

b. Purcell and Bloch

c. Cotton and Wilkinson

d. Linus Pauling

Q37 Which of the following reagents are used in Brown Ring test?

a. $FeSO_4$+ Conc. H_2SO_4

b. $NaNO_2$+Conc. H_2SO_4

c. $AgNO_3$ + Conc.H_2SO_4

d. $FeSO_4$+ Conc. HCl

Q38 Which of the following can be drained down safely?

a. Mineral oil

b. Hypochlorite solution

c. Biocides

d. Cyanides

Q39 What is the purpose of a safety shower in a laboratory?

a. To provide drinking water

b. To rinse laboratory equipment

c. To cool down the laboratory temperature

d. To quickly rinse off chemicals from a person's body

Q40 Which of the following ion when reacted with DMG gives bright red complex?

a. Cu+2

b. Ni+2

c. Fe+2

d. Ti+2

Q41 How to heat a solution of ethanol in a test tube?

a. Heat in water bath

b. Heat directly

c. Heat in sand bath

d. None of the above

Q42 What does the "corrosive" symbol on a chemical container indicate?

a. The chemical is explosive

b. The chemical can cause electrical shocks

c. The chemical is highly toxic

d. The chemical can cause severe burns or damage to materials

Q43 How should you dispose of hazardous chemical waste?

a. Pour it down the sink with plenty of water

b. Place it in the regular trash bin

c. Follow proper disposal guidelines and regulations

d. Store it indefinitely for future use

Q44 How to dilute concentrated acids like sulfuric and nitric acids?

a. Take acid in the beaker and pour water in it

b. Add both water and acid together in the container

c. Take water in the beaker and then add in less amounts and correspondingly do the dilution

d. All of the above

Q45 Globally Harmonized System of Classification and Labeling of Chemicals document is known as

a. Purple Book

b. Red Data Book

c. Red Data Sheet

d. Chemical Sheet

Q46 What is the purpose of a fume hood in a laboratory?

a. To store chemicals safely

b. To provide a comfortable working environment

c. To prevent chemical spills

d. To remove harmful fumes and gases

Q47 Which of the following is not a component of universal antidote for treating any poison ingestion?

a. Common salt

b. Magnesium oxide

c. Active Charcoal

d. Tannic acid

Q48 What does MSDS stand for in chemical safety?

a. Material Safety Data Sheet

b. Mandatory Safety Documentation Standard

c. Chemical Hazard Assessment Report

d. Material Storage and Disposal System

Q49 Which of the following is an example of a chemical hazard?

a. Slippery floors

b. Loud noise

c. High temperature

d. Toxic fumes

Q50 Arrange the following in increasing order of energy: 333 cm^{-1}, 1750 cm^{-1}, 12722 nm, 2500nm

a. 333 cm^{-1}, 12722 nm, 1750 cm^{-1}, 2500nm

b. 333 cm^{-1}, 12722 nm, , 2500nm, 1750 cm^{-1}

c. 12722 nm, 1750 cm^{-1}, 2500nm, 333 cm^{-1}

d. 1750 cm^{-1}, 2500nm, 333 cm^{-1}, 12722 nm

Q51 Which of the following complex is an exception to EAN rule

a. $[Ni(NH_3)_6]Cl_2$

b. $Ni(CO)_4$

c. $Fe(CO)_5$

d. $K_4[Fe(CN)_6]$

Q52 Sodium element is

- **a. paramagnetic**
- b. diamagnetic
- c. ferromagnetic
- d. none of them

Q53 In coordination compounds, geometrical isomerism is shown by

- a. octahedral molecules
- b. tetrahedral molecules
- c. square planar molecules
- **d. both octahedral and square planar molecules**

Q54 In Werner's theory, primary valency stands for

- a. Charge on central metal ion
- b. Charge on ligand
- c. Number of ligands
- **d. Charge on complex ion**

Q55 Which of the following does not have a regular geometry?

- **a. PCl_5**
- b. PCl_3
- c. CH_4
- d. NH_3

Q56 Which of the following is optically active?

- **a. *cis*-$[Co(en)_2Cl_2]^+$**
- b. *trans*-$[Co(en)_2Cl_2]^+$
- c. both of them
- d. none of them

Q57 How many atoms can lie in any one plane in PCl_5 molecule?

- a. 3
- b. 2
- c. 5
- **d. 4**

Q58 How many isomers are possible for the complex $[Co(NH_3)_3Cl_3]$ in a planar hexagon geometry?

a. 4

b. 3

c. 2

d. 1

Q59 Which of the following does not contain a tetrahedral geometry around the central atom?

a. $BeCl_2$

b. Al_2Cl_6

c. BCl_3

d. NH_3

Q60 What happens when sulphuric acid is added to "hypo" solution?

a. a solution of sulphur is formed

b. a gel is formed

c. a precipitate is formed

d. none of the above

Q61 The statement "the electropositive and electronegative elements are separated by noble gases", was given by

a. Kossel

b. Lewis

c. Werner

d. Dalton

Q62 Potential energy curve for hydrogen molecule shows that magnitude of attractive forces is

a. greater than repulsive forces

b. smaller than repulsive forces

c. equal to repulsive forces

d. none of the above

Q63 Mark the odd cation

a. Na^+

b. Ca^{++}

c. Mg^{++}

d. NH_4^+

Q64 "In ionic compounds, covalence is promoted by a small cation and a large anion", is known as

a. Bronsted rule
b. Hund's rule
c. Lewi's rule
d. Fajan's rule

Q65 The quantum numbers of a 3p orbital are

a. n=1, l=3
b. n=1, l=1
c. n=23, l=3
d. n=3, l=1

Q66 Sum of hydration energies of cation and anion is equal to

a. lattice energy
b. heat of formation
c. ionization energy
d. heat of vaporisation

Q67 The order of stability of conformation of ethylene glycol is

a. Gauch>Anti>Eclipsed
b. Anti>Gauch>staggered
c. Eclipsed>staggered>Anti>Gauch
d. Anti>eclipsed>Gauch>staggered

Q68 Mention the correct IUPAC name of the following molecule

$HSCH_2CH_2CH_2COOH$

a. 3-thiopentanoic acid
b. 4-Thiobutanaldehyde
c. 5-Mercaptobutanoic acid
d. 1-Mercaptobutanoic acid

Q69 The chair conformation of cyclohexane is less stable than boat conformation due to

a. Angle strain
b. Torsional strain
c. Both A & B
d. Lateral strain

Q70 Which of the following reaction involves the generation of dichlorocarbene?

a. Hofmann Elimination
b. Halogenation of alkanes
c. Claisen condensation
d. Reimer Tiemann Reaction

Q71 Addition of $HgSO_4/H_2SO_4$ in $H_2O$to propene leads to

a. Propane
b. 1-Propanol
c. 2-Propanol
d. Propene

Q72 The addition $Br_2$to trans-2-butenegives

a. (+) 2,3-Dibromobutane
b. Meso 2,3-Dibromobutane
c. (-) 2,3-Dibromobutane
d. Racemic mixture

Q73 The reaction by mixture of formaldehyde and benzaldehydein the presence of base is

a. Aldol condensation
b. Perkin condensation
c. Cannizzaro's reaction
d. Both A & B

Q74 The order of stability of carbocation is

a. 3^0> benzyl>2^0> 1^0
b. benzyl>3^0> 2^0> 1^0
c. benzyl<3^0<2^0<1^0
d. 2^0>3^0> benzyl>1^0

Q75 Which of the following test used to detect carbohydrate?

a. Fehling test
b. Benedict's test
c. Tollens test
d. Molisch test

Q76 The cyclic structure of glucose can be explained by

a. Mutarotation
b. Optical isomerism
c. Polymerization reaction
d. Osazone formation

Q77 Which of the following is oleic acid?

a. Trans$CH_3{-}(CH_2)_7{-}CH{=}CH{-}(CH_2)_7{-}COOH$
b. Cis-$CH_3{-}(CH_2)_7{-}CH{=}CH{-}(CH_2)_7{-}COOH$
c. cis $CH_3{-}(CH_2)_6{-}CH{=}CH{-}(CH_2)_6{-}COOH$
d. Trans $CH_3{-}(CH_2)_6{-}CH{=}CH{-}(CH_2)_6{-}COOH$

Q78 Acetophenone is prepared from benzene by

a. Halogenation
b. Friedel-Crafts Alkylation
c. Nitration
d. Friedel-Crafts Acylation

Q79 Which of the following is an example of basic amino acid?

a. Gly
b. Cys
c. Lys
d. Phe

Q80 The reaction which leads to carbon-carbon bond formation is

a. Aldol condensation
b. Cannizzaro reaction
c. Ozonolysis
d. epoxidation of double bond

Q81 Which of the following nitrogen base is not present in RNA?

a. Adenine
b. Cytosine
c. Thymine
d. Uracil

Q82 Glycogen is _____ chain polymer of_____?

a. branched, glucose
b. linear, glucose
c. branched, galactose
d. branched, lactose

Q83 Starch is a polymer of

a. Amylose & Amylopectin
b. Nucleosides
c. N-acetyl glucosamine
d. Galactose

Q84 When the velocity of enzyme activity is plotted against substrate concentration, which of the following is obtained?

a. Hyperbolic curve
b. Parabola
c. Straight line with positive slope
d. Straight line with negative slope

Q85 What is the full form of HOMO?

a. Highest occupied molecules
b. High molecular orbitals
c. High energy orbitals
d. Highest occupied molecular orbitals

Q86 Which of the following is correct for the resultant polymer product formed, when molecules of phthalic acid react with molecules of glycerol?

a. cross-link polymer

b. linear polymer

c. branch polymer

d. none of the mentioned

Q87 The correct expression for Bragg's law is $n\lambda =$ _____

a. $d\sin\theta$

b. $d\cos\theta$

c. $2d\sin\theta$

d. $2d\cos\theta$

Q88 In photochemical reactions, absorption of _____ radiations takes place.

a. ultraviolet and visible

b. radio

c. only visible

d. visible and x-rays

Q89 Equivalent conductance of a strong electrolyte increases on dilution due to _____

a. An increase in the number of ions and the ionic mobility of solution

b. Complete dilution of the electrolyte at standard dilution

c. An increase in the ionic mobility of solution

d. None of the above

Q90 What will happen if at equilibrium the concentration of one of the reactants is increased?

a. equilibrium will shift in the forward direction

b. equilibrium population will not change

c. equilibrium will shift in the backward direction

d. equilibrium will move to and fro

Q91 During the motion, if the centre of gravity of molecule changes, the molecule possess _____

a. Electronic energy

b. Translational energy

c. Rotational energy

d. Vibrational energy

Q92 Stability increases, as the energy _____

a. Increases

b. Does not change

c. Decreases

d. increases and then decreases

Q93 The scattering of waves in Bragg's law experiment is due to _____.

a. Einstein's scattering

b. Rayleigh scattering

c. Newton scattering

d. Inelastic scattering

Q94 Which of the following is a thermosetting polymer?

a. Neoprene

b. Bakelite

c. Polystyrene

d. Terylene

Q95 Which of the following explains the increase in the reaction rate by a catalyst?

a. Catalyst decreases the rate of backward reaction so that rate of forward reaction increases

b. Catalyst provides extra energy to reacting molecules so that they produce effective collisions

c. Catalyst provides an alternative path of lower activation energy to the reactants

d. Catalyst increases the number of collisions between the reacting molecules

Q96 Ozone is formed by _____ dissociation of molecular oxygen into individual oxygen atoms.

a. Photochemical

b. Thermochemical

c. Thermal

d. Ionic

Q97 Which of the following factors do you think will not affect the state of the equilibrium?

a. Concentration
b. Pressure
c. Temperature
d. Color

Q98 The correct order of different types of energies is _____

a. $E_{el} >> E_{rot} >> E_{vib} >> E_{tr}$
b. $E_{el} >> E_{vib} >> E_{tr} >> E_{rot}$
c. $E_{tr} >> E_{vib} >> E_{rot} >> E_{el}$
d. $E_{el} >> E_{vib} >> E_{rot} >> E_{tr}$

Q99 Combination of two atomic orbitals results in the formation of two molecular orbitals namely _____

a. one bonding and one non-bonding orbital
b. two bonding orbitals
c. two non-bonding orbitals
d. two bonding and non-bonding orbitals

Q100 The molar conductance of a solution _____ with dilution while its specific conductance _____ with dilution.

a. Decreases, Increases
b. Increases, Decreases
c. Decreases, Decreases
d. Increases, Increases

Correct Option is marked in bold

Q1 The shape of the normal curve depends on its

a. Mean deviation

b. Standard deviation

c. Quartile deviation

d. Correlation

Q2 Which one of the following statements is true for all real symmetric matrices?

a. All the eigenvalues are real

b. All the eigenvalues are positive

c. All the eigenvalues are distinct

d. Sum of all the eigenvalues is zero

Q3 The trace and determinant of 2x2 matrix are known to be -2 and -35 respectively. Its eigen values are

a. -30 and -5

b. -37 and -1

c. -7 and 5

d. 17.5 and -2

Q4 Given $\frac{dy}{dx} = xy \; with \; y(1) = 5$ and using step size h=0.1 ,the value at y(1.1) by using Runge-kutta 4th order method is (up to 3 decimal places)

a. 5.232

b. 5.554

c. 6.235

d. 6.325

Q5 What is the solution at x=0.25 by using the Taylor method to solve the following equation $y' = x^2 + y^2$ given y (0) =1

a. 1.333

b. 2.333

c. 3.333

d. 4.333

Q6 Classify the following differential equation: $e^x \frac{dy}{dx} + 3y = x^2 y$

a. Separable and not linear

b. Linear and not separable

c. Both separable and linear

d. Neither separable nor linear

Q7 The differential equation $2\frac{dy}{dx} + x^2 y = 2x + 3, y(0) = 5$ is

a. Non-linear

b. Linear

c. Linear with fixed constants

d. Undeterminable to be linear or non-linear

Q8 The velocity *v* (in kilometer/minute) of a Train which starts from rest, is given at fixed intervals of time *t*(in minutes) as follows:

t	2	4	6	8	10	12	14	16	18	20
v	10	18	25	29	32	20	11	5	2	0

The approximate distance (in kilometers) rounded to two places of decimals covered in 20 minutes using Simpson's 1/3rd rule is:

a. 405.33

b. 110.33

c. 105.33

d. 309.33

Q9 The Newton-Raphson iteration $x_{n+1} = \frac{1}{2}\left(x_n + \frac{R}{x_n}\right)$ can be used to compute

a. Square root of R

b. Logarithm of R

c. Reciprocal of R

d. Square of R

Q10 Function *f* is known at the following points

X	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
Y	1	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0

The value of the integral of *f(x)* between x=0 and x=1.0 by Trapezoidal rule is:

a. 3

b. 4

c. 2

d. 5

Q11 The post-order traversal of a binary search tree is given by 2,7,6,10,9,8,15,17,20,19,16,12. Then the pre-order traversal of this tree is:

a. 2,6,7,8,9,10,12,15,16,17,19,20

b. 7,6,2,10,9,8,15,16,17,20,19,12

c. 7,2,6,8,9,10,20,17,19,15,16,12

d. 12,8,6,2,7,9,10,16,15,19,17,20

Q12 Which of the following of a random variable is a measure of spread?

a. Variance

b. standard deviation

c. empirical mean

d. all of the Mentioned

Q13 The square root of the variance is called the _____ deviation.

a. empirical

b. mean

c. Continuous

d. Standard

Q14 Which of the following inequality is useful for interpreting variances?

a. Chebyshev

b. Stautaory

c. Testory

d. All of the Mentioned

Q15 Which of the following is incorrect with respect to use of Poisson distribution?

a. Modeling event/time data

b. Modeling bounded count data

c. Modeling contingency tables

d. All of the Mentioned

Q16 Which of the following testing is concerned with making decisions using data ?

a. Probability

b. Hypothesis

c. Causal

d. None of the mentioned

Q17 What is the purpose of multiple testing in statistical inference?

a. Minimize errors

b. Minimize false positives

c. Minimize false negatives

d. All of the Mentioned

Q18 Normalized data are centered at ___ and have units equal to standard deviations of the original data.

a. 0

b. 5

c. 1

d. 10

Q19 Which of the following is example use of Poisson distribution?

a. Analyzing contingency table data

b. Modeling web traffic hits

c. Incidence rates

d. All of the Mentioned

Q20 Classify the following differential equation:

$$\frac{dx}{dt} = \frac{x + 2xt + cost}{1 + t^2}$$

Which of the following option is correct?

a. Separable and not linear

b. Linear and not separable

c. Both separable and linear

d. Neither separable nor linear

Q21 Find the eigenvalues of B= $\begin{bmatrix} 1 & 2 & -4 \\ -1 & 4 & 8 \\ 0 & 1 & -1 \end{bmatrix}$.

a. -1,1,4

b. -4,-1,1

c. -5,1,2

d. -2,1,5

Q22 What's going to happen when we compile and run the following C program snippet?

```
#include "stdio.h"
int main()
{
 int a = 10;
int b = 15;

printf("=%d",(a+1),(b=a+2));
printf(" %d=",b);

return 0;
}
```

a. =11 15=

b. =11 12=

c. Compiler Error due to (b=a+2) in the first printf()

d. No compiler error

Q23 Let I be the identity transformation of the finite dimensional vector space V, then the nullity of I is

a. dimV

b. 0

c. 1

d. dimV – 1

Q24 A and B are n-square positive matrices. Then which of the following are positive definite.

a. A+B

b. ABA

c. AB

d. A^2+I

Q25 Which of the following statement is false?

a. Checking the ambiguity of CFL is decidable

b. Checking whether a given context free language is regular is decidable

c. Checking whether a given context free language is empty is decidable

d. Both a and b

Q26 Which design strategy encompasses all of the components below except _____.

a. Data collection design

b. Sampling design

c. Instrument development

d. Data Analysis

Q27 In Standard normal distribution, the value of median is

a. 1

b. 0

c. 2

d. Not fixed

Q28 Which of the following mentioned standard Probability density functions is applicable to discrete Random Variables?

a. Gaussian Distribution

b. Poisson Distribution

c. Rayleigh Distribution

d. Exponential Distribution

Q29 To find the value of sin (9) the Taylor Series expansion should with center as

a. 9

b. 8

c. 7

d. None of the above

Q30 The point (0,0) in the domain of f(x,y) = sin(xY) is a point of

a. Saddle
b. Minima
c. Maxima
d. Constant

Q31 If the Hessian matrix of a function is zero then the critical point is

a. It cannot be concluded
b. Always at origin
c. Depends of Function
d. (100,100)

Q32 For a Poisson Distribution, if mean(m)=1, then P (1) is

a. 1/e
b. e
c. e/2
d. Indeterminate

Q33 Normal Distribution is applied for

a. Continuous Random Distribution
b. Discreate Random Variable
c. Irregular Random Variable
d. Uncertain Random Variable

Q34 For a standard normal variate, the value of mean is

a. ∞
b. 1
c. 0
d. Not defined

Q35 Normal distribution is also known as

a. Cauchy's Distribution
b. Laplacian Distribution
c. Gaussian Distribution
d. Lagrangian Distribution

Q36 Skewness of Normal distribution is

a. Negative
b. Positive
c. 0
d. Undefined

Q37 The shape of the normal curve depends on its

a. Mean deviation
b. Standard deviation
c. Quartile deviation
d. Correlation

Q38 Poisson distribution is applied for

a. Continuous Random Variable
b. Discrete Random Variable
c. Irregular Random Variable
d. Uncertain Random Variable

Q39 Skewness of Normal distribution is

a. Negative
b. Positive
c. 0
d. Undefined

Q40 If f(x) = |x|, then the interval [-1,1], f(x)

a. Satisfied all the conditions of Rolle's Theorem
b. Satisfied all the conditions of Mean value Theorem
c. Does not satisfied the conditions of Mean Value Theorem
d. None of the above

Q41 The function f(x) = 3x(x-2) has a

a. Minimum at x=1
b. maximum at x=1
c. Minimum at x=2
d. Maximum at x=2

Q42 Let f(x) = lxl, then

a. f'(0) = 0
b. f(x) is maximum at x = 0
c. f(x) is minimum at x = 0
d. None of these

Q43 Integration $\int logx\ dx$ has the value

a. x logx -1
b. logx – x
c. c. x(logx-1)
d. none of the above

Q44 Normal Distribution is symmetric is about

a. Variance
b. Mean
c. Standard deviation
d. Covariance

Q45 Using Newton-Raphson method, find a root correct to three decimal places of the equation x^3-3x-5 = 0

a. 2.275
b. 2.279
c. 2.222
d. None of the above

Q46 The order of error s the Simpson's rule for numerical integration with a step size h is

a. h
b. h^2
c. h^3
d. h^4

Q47 In which of the following methods proper choice of initial value is very important?

a. Bisection method
b. False Position

c. Newton-Rapshon

d. Bairsto method

Q48 The bisection method is applied to compute a zero of the function $f(x)=x^4-x^3-x^2-4$ in the interval [1,9]. The method convers to a solution after ----------iterations.

a. 1

b. 3

c. 5

d. 7

Q49 Consider function $f(x) = (x^2-4)^2$ where x is a real number. Then the function has

a. Only one minima

b. Only two minima

c. Three Minima

d. Three Maxima

Q50 A cubic polynomial with real coefficients

a. Can possibly have no extrema and no zero crossings

b. May have up to three extrema and up to 2 zero crossing

c. Can not have more than two extrema and more than three zero crossings

d. will always have an equal number of extrema and zero crossings

Q51 The protocol data unit (PDU) for the application layer in the internet stack is:

a. Segment

b. Datagram

c. Message

d. Frame

Q52 The IEEE 802.3 standard defines _____CSMA/CD as the access method for first-generation 10-Mbps ethernet.

a. 1-persistent

b. P-persistent

c. Non-persistent

d. None of the above

Q53 Error control and flow control are responsibilities of

a. Data link and network layers
b. Data link and physical layers
c. Application and presentation layers
d. Data link and transport layer

Q54 The client in socket programming must know which information?

a. IP address of server
b. Port number
c. Both IP address of server & port number
d. None of the above

Q55 In open-loop control, policies are applied to_____.

a. Remove after congestion occurs
b. Remove after some time
c. Prevent before congestion occurs
d. Prevent before sending packets

Q56 Which one of the following is a cryptographic protocol used to secure HTTP connection?

a. Stream control transmission protocols (SCTP)
b. Transport layer security (TSL)
c. Explicit congestion notification (ECN)
d. Resource reservation protocol

Q57 Network layer firewall has two sub-categories as:

a. State full firewall and stateless firewall
b. Bit oriented firewall and byte-oriented firewall
c. Frame firewall and packet firewall
d. None of the above

Q58 A language L of palindrome strings over $\{a, b\}$

a. can be recognized by a finite automation
b. cannot be recognized by a finite automation
c. can be recognized by only an NFA
d. all the above are true

Q59 Which of the following statements is false?

a. All CFGs can be transformed to CNF.

b. All CFGs can be transformed to GNF.

c. Some CFGs can not be transformed to GNF

d. Normal forms make the automation process easier.

Q60 A Turing machine is more powerful than the PDA because

a. the head can move in both directions

b. the current input symbol can be changed

c. the tape is finite

d. all the above

Q61 An S-attributed definition can be evaluated _____.

a. Top down

b. Bottom up

c. Both

d. None

Q62 _____ is an invalid three address code.

a. Quadruple

b. Threaded code

c. Triple

d. Indirect Triple

Q63 A pulse train can be delayed by a finite number of clock periods using

a. a serial-in serial-out shift register

b. a serial-in parallel-out shift register

c. a parallel-in serial-out shift register

d. a parallel-in parallel-out shift register

Q64 It is desired to generate an audio tone of 440 Hz from a 2.4576 MHZ clock signal using 8254 Programmable counter. The appropriate mode of operation of 8254 and initial BCD count is:

a. Mode 2 and BCD Count =5585

b. Mode 2 and BCD Count =1585

c. Mode 3 and BCD Count =5585

d. Mode 4 and BCD Count =1585

Q65 Which of the following is a not self-complementing code

a. BCD

b. EXCESS 3

c. 2421

d. 84-2-1

Q66 A computer has a cache, main memory, and a disk used for virtual memory. If a referenced word is in the cache, 20 ns are required to access it. If it is in main memory but not in the cache, 60 ns are needed to load it into the cache, and then the reference is started again. If the word is not in main memory, 12 ms are required to fetch the word from disk, followed by 60 ns to copy it to the cache, and then the reference is started again. The cache hit ratio is 0.9 and the main memory hit ratio is 0.6. What is the average time in nanoseconds required to access a referenced word on this system?

a. 490028 ns

b. 580045ns

c. 480026ns

d. 370028ns

Q67 Consider a hash table of size seven, with starting index zero, and a hash function

$$(3x + 4) \bmod 7$$

Assuming the hash table is initially empty, which of the following is the contents of the table when the sequence 1, 3, 8, 10 is inserted into the table using closed hashing? Here symbol '_' denotes an empty location in the table.

a. 8, _, _, _, _, _, 10

b. 1, 8, 10, _, _, _, 3

c. 1, _, _, _, _, _,3

d. 1, 10, 8, _, _, _, 3

Q68 Which of the following standard algorithms is not Dynamic Programming based?

a. Bellman–Ford Algorithm for single source shortest path

b. Floyd Warshall Algorithm for all pairs shortest paths

c. 0-1 Knapsack problem

d. Prim's Minimum Spanning Tree

Q69 What is recurrence for worst case of Quicksort and what is the time complexity in Worst case?

a. Recurrence is T(n) = T(n-2) + O(n) and time complexity is O(n^2)

b. Recurrence is T(n) = T(n-1) + O(n) and time complexity is O(n^2)

c. Recurrence is T(n) = 2T(n/2) + O(n) and time complexity is O(nLogn)

d. Recurrence is T(n) = T(n/10) + T(9n/10) + O(n) and time complexity is O(nLogn)

Q70 Which of the following standard algorithms is not a Greedy algorithm?

a. Dijkstra's shortest path algorithm

b. Prim's algorithm

c. Kruskal algorithm

d. Bellmen Ford Shortest path algorithm

Q71 Dijkstra's algorithm is based on which of the following paradigm?

a. Greedy paradigm

b. Backtracking paradigm

c. Dynamic Programming paradigm

d. Divide and Conquer paradigm

Q72 The time taken for the desired sector to rotate to the disk head is called:

a. positioning time

b. random access time

c. seek time

d. rotational latency

Q73 Which of the following condition is required for deadlock to be possible?

a. mutual exclusion

b. a process may hold allocated resources while awaiting assignment of other resources

c. no resource can be forcibly removed from a process holding it

d. all of the mentioned

Q74 In priority scheduling algorithm, when a process arrives at the ready queue, its priority is compared with the priority of

a. all process

b. currently running process

c. parent process

d. init process

Q75 When a program tries to access a page that is mapped in address space but not loaded in physical memory, then

a. segmentation fault occurs

b. fatal error occurs

c. page fault occurs

d. no error occurs

Q76 The accuracy of the working set depends on the selection of:

a. working set model

b. working set size

c. memory size

d. number of pages in memory

Q77 The lexical analysis for a modern computer language such as java needs the power of which one of the following machine models in a necessary and sufficient sense?

a. Finite state automata

b. Deterministic pushdown automata

c. Non-deterministic pushdown automata

d. Turing machine

Q78 Which of the following is performed by Data Scientist?

a. Define the question

b. Create reproducible code

c. Challenge results

d. All of the above

Q79 Which of the following technique comes under practical machine learning?

a. Bagging

b. Boosting

c. Forecasting

d. None of the above

Q80 Which of the following command allows you to change directory to one level above your parent directory?

a. Cd

b. Cd.

c. Cd..

d. None of the above

Q81 Which of the following is not a CLI command?

a. Delete

b. Rm

c. Clear

d. none of the mentioned

Q82 Which of the following systems record changes to a file over time?

a. Record Control

b. Version Control

c. Forecast Control

d. None of the mentioned

Q83 Which of the following is a revision control system?

a. Git

b. NumPy

c. Slidify

d. None of the above

Q84 The square root of the variance is called the _____ deviation.

a. Empirical

b. Mean

c. Continuous

d. Standard

Q85 Which of the following inequality is useful for interpreting variances?

a. Chebyshev

b. Stautaory

c. Testory

d. All of the above

Q86 Chebyshev's inequality states that the probability of a "Six Sigma" event is less than _____

a. 10%

b. 20%

c. 30%

d. 3%

Q87 Which of the following random variables are the default model for random samples?

a. Iid

b. Id

c. Pmd

d. all of the above

Q88 Which of the following is incorrect with respect to use of Poisson distribution?

a. Modeling event/time data

b. Modeling bounded count data

c. Modeling contingency tables

d. All of the mentioned

Q89 Which of the following form the basis for frequency interpretation of probabilities?

a. Asymptotics

b. Symptotics

c. Asymmetry

d. All of the mentioned

Q90 Normalized data are centered at ___ and have units equal to standard deviations of the original data.

a. 0

b. 5

c. 1

d. 10

Q91 Which of the following refers to the circumstance in which the variability of a variable is unequal across the range of values of a second variable that predicts it?

a. Heterogeneity

b. Heteroskedasticity

c. Heteroelasticty

d. None of the mentioned

Q92 Which of the following is characteristic of best machine learning method?

a. Fast
b. Accuracy
c. Scalable
d. All of the above

Q93 Which of the following method can be used to combine different classifiers?

a. Model stacking
b. Model combining
c. Model structuring
d. None of the mentioned

Q94 For which value of x will $(x - 1)(3 - x)$ have its maximum?

a. 0
b. 1
c. 2
d. -2

Q95 Two vectors having the same initial points are called as _____

a. collinear vectors
b. unit vectors
c. coinitial vectors
d. equal vectors

Q96 The matrix which follows the conditions m=n is called?

a. Square matrix
b. Rectangular matrix
c. Scalar matrix
d. Diagonal matrix

Q97 Which of the following is a type of computer architecture?

a. Microarchitecture
b. Harvard Architecture
c. Von-Neumann Architecture

d. All of the above

Q98 Which of the architecture is power efficient?

a. RISC

b. ISA

c. IANA

d. CISC

Q99 To reduce the memory access time we generally make use of _____

a. SDRAM's

b. Heaps

c. Cache's

d. Higher capacity RAM's

Q100 The controller multiplexes the addresses after getting the _____ signal.

a. INTR

b. ACK

c. RESET

d. Request

Correct Option is marked in bold

Q1 A mediator variable is:

a. responsible for the relationship between two other variables

b. another name for the independent variable

c. another name for the dependent variable

d. all of the above

Q2 A researcher divides his population into certain groups and fixes the size of the sample from each group. It is called:

a. Stratified sample

b. Quota sample

c. Cluster sample

d. All of the above

Q3 What is deemed a good measure of the quality of a journal?

a. The intake factor

b. The impact factor

c. The OPAC factor

d. The influence factor

Q4 Which of the following show the proportion of variance shared between two variables?

a. Correlation

b. Standard error

c. Attenuation

d. Co-efficient of determination

Q5 The appropriate analytical technique is determined by

a. The research design

b. Nature of the data collected

c. Nature of the hypothesis

d. Both a & b

Q6 To obtain the freest opinion of the respondent, when we ask general question before a specific question then this procedure is called as the:

a. Research technique
b. Qualitative technique
c. Funnel technique
d. Quantitative technique

Q7 Sustainable Development Goal number 4 deals with:

a. Poverty
b. Gender
c. Education
d. Equality

Q8 Gaining knowledge about the way media institutions work and how they produce content is known as:

a. Journalism Training
b. Mass Communication Education
c. Media and Information Literacy
d. Communication Training

Q9 'Oligopoly' in media industry refers to:

a. Industry monopolised by large number of media Companies
b. Industry monopolised by small number of media Companies
c. Industry monopolised by medium number of media Companies
d. None of the above

Q10 On what basis did Jean Piaget give his theory of cognitive development of humans?

a. Evaluation Research
b. Fundamental Research
c. Applied Research
d. Action Research

Q11 The research that is especially carried out to test and validate the study hypotheses is termed as:

a. Fundamental research
b. Applied research
c. Conclusive research
d. Exploratory research

Q12 Which of the following variables cannot be expressed in quantitative terms?

a. Socio-economic Status
b. Numerical Aptitude
c. Marital Status
d. Professional Attitude

Q13 Which of the following is a criterion of good research problem?

a. Should characterize the relationship between two or more variables.
b. Research issue should be formulated as a query
c. Issue must be able to be empirically checked
d. All of the above

Q14 Schematic literature review is

a. One which generates a literature review using a treasure hunt system.
b. A replicable, scientific, and transparent process.
c. One which gives equal attention to the principal contributors to the area.
d. A manufactured system for generating literature reviews tailored to your subject.

Q15 The main purpose of research in education is to _____.

a. Help in the personal growth of an individual
b. Help the candidate become an eminent educationist
c. Increase job prospects of a individual.
d. Increase social status of an individual.

Q16 When data is classified according to the magnitude it is called:

a. Chronological
b. Quantitative
c. Qualitative
d. Continuous

Q17 Continuous variables are represented by

a. Histogram
b. Line diagram
c. Pie chart

d. Bar diagram

Q18 Hypothesis must have _____

a. Applicability
b. Durability
c. Testability
d. Measurement

Q19 In _____ the main purpose is to formulate a problem for more precise investigation.

a. Exploratory study
b. Descriptive study
c. Diagnostic study
d. None of the above

Q20 An example of probability sampling is

a. Quota Sampling
b. Snow-ball sampling
c. Purposive sampling
d. Lottery method

Q21 _____ designs involve the collection of information from any given sample of population elements only once.

a. Exploratory
b. Causal
c. Cross-sectional
d. None of the above

Q22 The aggregate of all the elements, sharing some common set of characteristics, that comprises the universe for the purpose of the marketing problem is the

a. population
b. sampling frame
c. element
d. census

Q23 A subgroup of the elements of the population selected for participation in the study is a

a. judgmental sample

b. sample

c. sampling unit

d. sampling frame

Q24 Which of the following conditions does not favor the use of a census?

a. There is high variance in the characteristic to be measured.

b. The cost of nonsampling errors is low.

c. The population is large.

d. The cost of sampling errors is high.

Q25 is a probability sampling technique in which each element in the population has a known and equal probability of selection. Every element is selected independently of every other element and the sample is drawn by a random procedure from a sampling frame.

a. Stratified sampling

b. Simple random sampling

c. Systematic sampling

d. Cluster sampling

Q26 The mean always equals:

a. the arithmetic average

b. the median

c. the mode

d. the range

Q27 Which of the following problems require research

a. Flexible work hours schedule on intention to leave organization

b. Acceptance of more women-oriented serials (Programme) on prime time

c. Voting patterns of western versus eastern UP

d. All of the above

Q28 The primary objective of is to provide insights into, and an understanding of, the problem confronting the researcher.

a. Exploratory research

b. Conclusive research

c. Causal research

d. Descriptive research

Q29 Descriptive research is conducted for all the following reasons except

a. To describe the characteristics of relevant groups, such as consumers, company personnel, organizations, or territories

b. To determine the occurrence of the study variables

c. To understand which variables are the cause and which variables are the effect of a phenomenon

d. To determine the perceptions of construct and their features

Q30 In an experiment, the researcher manipulates one or more variables to determine its effect on the

a. Independent variable

b. Dependent variable

c. Treatment

d. Test variable

Q31 A technique in which a single respondent is questioned one-on-one by a highly skilled interviewer to uncover underlying motivations, beliefs, attitudes, and feelings on a topic is called-

a. Focus group

b. Projective interview

c. In-depth interview

d. Unstructured interview

Q32 What type of question is the following: If you were to select your favorite holiday destination and what are the reasons for this. What would be your answer?

a. Leading question

b. Loaded question

c. Fixed-alternative question

d. Open-ended question

Q33 When the marketing department of an organization attempts to determine the amount of time the managers in this department spend at their computers in their offices each week, this is an example of which type of research?

a. Observational study

b. Advancement in theory research

c. Applied research

d. casual study

Q34 According to the textbook, the most important reason for NOT beginning the formal quantitative research process is:

a. the budget is unspecified.

b. top management has not given approval.

c. the research department is overburdened with project requests.

d. the problem has not been clearly defined.

Q35 Which of the following is database of journals?

a. Elsevier

b. medical

c. engineering

d. science

Q36 If 400 people are mailed a questionnaire and 120 of them return it to the researcher, this survey is said to have a response rate of:

a. 120

b. 3.33

c. 30 percent

d. 400

Q37 When the wear-and-tear on the cover of a library book is used as a measure of the frequency with which this book has been used, this is an example of:

a. visible observation

b. physical-trace evidence

c. mechanical observation

d. content analysis

Q38 The first time Shruti visited a friend's home, they walked around his vegetable garden and she noted the many varieties of tomatoes he grew. She was surprised to learn later that he did not like to eat fresh tomatoes. Her surprise was the result of which of the following?

a. Representativeness heuristic

b. Base-rate fallacy

c. Availability heuristic

d. False consensus

Q39 Which of the following statements about emotions is true?

a. Always occur immediately after the stimuli that elicit them

b. Do not occur spontaneously

c. Are independent of cognitive processes

d. Are elicited by neutral stimuli

Q40 When faced with the prisoner's dilemma, the best joint outcome is which of the following?

a. Neither suspect A or B to confess

b. Suspect A (but not suspect B) to confess

c. Suspects A and B both to confess

d. Suspect B (but not suspect to confess

Q41 What are the implications of inferring causality from a correlation?

a. Dangerous, as the correlation may be spurious.

b. There is no way of inferring the direction of causality from a correlation alone. Other factors must be considered.

c. Two (or more) variables may correlate either positively or negatively, this does not imply causality.

d. All of the above.

Q42 If the results of an experiment are statistically significant, what may we conclude?

a. Experiment was important

b. Results were probably not due to chance

c. Dependent variable had an effect on the independent variable

d. Operational definitions were reliable

Q43 Sampling techniques that use chance selection procedures are called:

a. Probability sampling techniques

b. Nonprobability sampling techniques

c. Convenience sampling

d. Quota sampling

Q44 In regression analysis, the variable that is being predicted is the

a. Intervening variable

b. Dependent variable

c. Independent variable

d. Inverse variable

Q45 The term 'Intellectual Property Rights' covers

a. Only the design

b. Only the equipment

c. Only the logo

d. Design, logo and equipment

Q46 What is the purpose of a pilot study?

a. To test the reliability and validity of the measures

b. To determine the appropriate sample size

c. To collect preliminary data

d. To test the feasibility of the research design

Q47 What is the relationship between hypothesis formulation and research design?

a. Hypothesis formulation guides the research design

b. Research design guides hypothesis formulation

c. Hypothesis formulation is not relevant to research design

d. Research design and hypothesis formulation are independent of each other

Q48 A simple random sampling is one in which

a. all units of the population are selected

b. Every unit of the population has an equal chance of being selected

c. only one segment of population is selected

d. sampling technique which is simplified

Q49 "A fixed sample (or samples) of population elements is measured repeatedly on the same variables". This is the characteristic of ….

a. exploratory research design

b. Longitudinal

c. causal research design

d. All of the above

Q50 In _____an initial group of respondents is selected. After being interviewed, these respondents are asked to identify others who belong to the target population of interest. Subsequent respondents are selected based on the referrals.

a. stratified random sampling

b. cluster sampling

c. snowball sampling

d. Area sampling

Q51 Good Design Award is associated with which country

a. Korea

b. China

c. Taiwan

d. Japan

Q52 The National Design Policy of India was announced in the year –

a. 2001

b. 1990

c. 2007

d. 2016

Q53 Which of the following is earned by an Individual -

a. Identity

b. Mascot

c. Memento

d. Trophy

Q54 Centre for Environment Education was founded by -

a. Rajeev Sethi

b. J Krishnamurthy

c. M S Swaminathan

d. Kartikeya Sarabhai

Q55 Helvetica, Powers of 10 and Objectified are names associated with -

a. Products

b. Films

c. Fashion

d. Books

Q56 Which of this device is related to Design –

a. Barometer

b. Lactometer

c. Thermometer

d. Lux meter

Q57 Bauhaus School of Design was founded by -

a. Paul Klee

b. Walter Gropius

c. Alexander Girard

d. William Morris

Q58 Font is measured in which unit

a. Centimetre

b. Inches

c. Millimetre

d. Point

Q59 Arm, Shoulder, Spine and Ears are part of

a. Type

b. Body

c. Fashion

d. Symbol

Q60 Apple Symbol is designed by

a. Rob Janoff

b. Steve Jobs

c. Steve Wozniak

d. Tim Cook

Q61 The word ‘Frutiger’ is associated with

a. Typeface

b. Colour
c. Composition
d. Perception

Q62 Which of this is not a modernist movement?

a. Art Nouveau
b. Pop art
c. Cubism
d. Gothic

Q63 Pithora painting is originated from?

a. Maharashtra
b. Madhya Pradesh
c. Gujarat
d. Chhattisgarh

Q64 'Guernica' is a famous painting by

a. Georges Braque
b. Pablo Picasso
c. Emil Nolde
d. Edvard Munch

Q65 International symbol of Breast cancer awareness is depicted by ribbon of which colour

a. Red
b. Pink
c. Black
d. White

Q66 The Man Booker International Prize is an award given for

a. Literature
b. Music
c. Performing art
d. Fine art

Q67 Ganjifa is associated with

a. Food
b. Entertainment
c. Game
d. Education

Q68 What range of electromagnetic spectrum is visible to human eye?

a. 390-700 nm
b. 500-700 nm
c. 300-550 nm
d. 400-690 nm

Q69 Which of these is not a museum?

a. MOMA
b. TATE
c. Louvre
d. Casa Mila

Q70 What is the primary goal of design research?

a. Profit maximization
b. Problem-solving
c. Data collection
d. Product promotion

Q71 In the context of design research, what does the term "persona" refer to?

a. A famous designer
b. A fictional representation of a target user
c. Personal biases in research
d. A design tool

Q72 Which research method involves observing and documenting users in their natural environment?

a. Surveys
b. Interviews
c. Ethnography
d. Case studies

Q73 What is the purpose of a usability test in design research?

a. To analyze market trends

b. To evaluate the ease of use of a product

c. To conduct competitor analysis

d. To assess brand perception

Q74 What does the term "A/B testing" refer to in design research?

a. Analyzing and brainstorming

b. Comparing two design variations to determine effectiveness

c. Assessing user preferences through surveys

d. Conducting focus group discussions

Q75 Which research method involves studying a small, representative group to gain insights applicable to a larger population?

a. Random sampling

b. Snowball sampling

c. Convenience sampling

d. Purposive sampling

Q76 What is the purpose of a mood board in the design process?

a. To present finalized designs

b. To collect and organize design inspiration

c. To conduct user testing

d. To create detailed design specifications

Q77 Which of the following is a key consideration in human-centered design?

a. Technology constraints

b. Aesthetic preferences

c. Profit margins

d. Market competition

Q78 What does the acronym "UX" stand for in the context of design research?

a. User Experience

b. User Exposure

c. User Execution

d. User Examination

Q79 What role does empathy play in design research?

a. Prioritizing profit over user satisfaction

b. Understanding and connecting with users' experiences

c. Ignoring user feedback

d. Focusing solely on aesthetic appeal

Q80 Which method is used to analyze the effectiveness of a website's layout and navigation?

a. Card sorting

b. Focus groups

c. Content analysis

d. Observational research

Q81 What is the purpose of a design critique session?

a. To finalize design decisions

b. To gather user feedback

c. To promote collaboration among team members

d. To document research findings

Q82 What is a key characteristic of a successful innovator?

a. Resistance to change

b. Risk aversion

c. Openness to new ideas

d. Reliance on traditional methods

Q83 Which innovation strategy involves introducing new products or services to existing markets?

a. Diversification

b. Market penetration

c. Product development

d. Market development

Q84 What does the acronym MVP stand for in the context of innovation?

a. Most Valuable Player

b. Minimum Viable Product

c. Market Value Proposition

d. Modular Venture Plan

Q85 What is the purpose of a SWOT analysis in the innovation process?

a. Evaluate competitors

b. Identify internal strengths and weaknesses

c. Forecast market trends

d. Develop promotional campaigns

Q86 What is the purpose of a design sprint in the innovation process?

a. Lengthen the development timeline

b. Speed up idea generation and prototyping

c. Focus solely on market research

d. Minimize user involvement

Q87 In the context of design and innovation, what does the term "pilot testing" refer to?

a. Testing ideas on a small scale before full implementation

b. Conducting a final product evaluation

c. Analyzing market trends

d. Launching a product without testing

Q88 What is the main goal of a blue ocean strategy in innovation?

a. Competing in an existing market space

b. Creating new market demand

c. Focusing on incremental improvements

d. Emulating competitors

Q89 Which factor is crucial for fostering a culture of innovation within an organization?

a. Strict adherence to established procedures

b. Fear of failure

c. Encouraging risk-taking and experimentation

d. Relying on hierarchical decision-making

Q90 What is the primary purpose of a design brief in the innovation process?

a. Finalize design decisions

b. Communicate project requirements and goals

c. Test and refine ideas

d. Conduct market analysis

Q91 Which type of innovation involves making significant improvements to existing products or processes?

a. Incremental innovation

b. Radical innovation

c. Disruptive innovation

d. Blue Ocean Strategy

Q92 In the innovation process, what is the purpose of a feasibility study?

a. Analyzing market trends

b. Evaluating the technical and economic viability of an idea

c. Finalizing design decisions

d. Conducting user surveys

Q93 Which innovation model involves creating a separate entity to develop and bring new products to market?

a. Skunkworks

b. Open innovation

c. Blue Ocean Strategy

d. Closed innovation

Q94 Which factor is essential for creating a culture of innovation within an organization?

a. Rigid hierarchical structures

b. Fear of experimentation and failure

c. Encouraging a diverse and inclusive workforce

d. Avoiding collaboration with external partners

Q95 What is the purpose of the "fail fast, fail cheap" principle in the innovation process?

a. Discourage experimentation

b. Minimize the impact of failures and learn quickly

c. Avoid testing ideas

d. Delay the innovation process

Q96 What does the term "co-creation" mean in the context of innovation?

a. Creating products without user input

b. Collaborating with users to generate ideas and solutions

c. Ignoring customer feedback

d. Focusing solely on internal expertise

Q97 What role does prototyping play in the innovation process?

a. Finalizing design decisions

b. Testing and refining ideas

c. Conducting market analysis

d. None of the above

Q98 Which factor is crucial for successful innovation in a rapidly changing market?

a. Avoiding risk and experimentation

b. Maintaining the status quo

c. Flexibility and adaptability

d. Relying solely on historical data

Q99 What role does storytelling play in the innovation process?

a. Minimizes user engagement

b. Communicates the value and purpose of the innovation

c. Delays project timelines

d. Ignores user feedback

Q100 In the context of design and innovation, what does the term "pivoting" refer to?

a. Maintaining the original course of action

b. Making significant changes to the project direction based on feedback

c. Avoiding user input

d. Finalizing design decisions

Correct Option is marked in bold

Part A - Research Methodology

1. Which of the following is not essential for external validity in experimental research?
   a. Proper randomization
   b. Large, representative sample
   c. **Control over confounders**
   d. Considering participant-intervention interaction

2. The main feature of qualitative research is:
   a. Construction of theory via data
   b. Randomized groups
   c. Statistical hypothesis testing
   d. Use of large samples

3. Which of the following gives the correct definition of research design?
   a. Specification of methods and procedures
   b. A research hypothesis
   c. Data analysis techniques
   d. Sampling framework

4. Which sampling method uses chance to select subjects?
   a. Cluster sampling
   b. Purposive sampling
   c. Systematic sampling
   d. Random sampling

5. Which is not a method of qualitative data collection?
   a. Focus group
   b. Observation
   c. Questionnaire
   d. Interview

6. A research design where the researcher manipulates one or more independent variables and measures their effect on a dependent variable is termed:
   a. Descriptive Research
   b. Experimental Research
   c. Correlational Research
   d. Historical Research

7. Which of the following is an example of a Non-Probability Sampling technique?
   a. Simple Random Sampling
   b. Quota Sampling
   c. Systematic Sampling
   d. Cluster Sampling

8. An extraneous variable in an experiment is one that:
   a. The researcher directly manipulates.
   b. Is expected to change as a result of the manipulation.
   c. Is always kept constant across all groups
   d. Could affect the dependent variable but is not the independent variable.

9. Ensuring 'Informed Consent' in a research study primarily addresses which ethical principle?
   a. Beneficence
   b. Justice
   c. Non-maleficence
   d. Respect for Persons/Autonomy

10. Sharpness of the peak of the statistical distribution is represented by
    a. Kurtosis
    b. Skewness
    c. Mean
    d. Median

11. Your measurements should show which of the following validities, if you want to generalize the results of your research to a different population?
    a. Construct validity
    b. Internal validity
    c. External validity
    d. Convergent validity

12. "Code numbers given to the religion of persons" is an example of data on which of the following scales of measurement?
    a. Nominal
    b. Ordinal
    c. Interval
    d. Ratio

13. A researcher is conducting a study on eating disorders. Using a list of recent participants in the online Weight Watchers program, she randomly selects a sample from the alphabetized list. This list represents the
    a. Sample
    b. Sampling frame
    c. Population
    d. Statistic

14. A contact lens wearer read that the producer of a new contact lens boasts that their lenses are cheaper than contact lenses from another popular company. The null hypothesis H_0:$\mu_{old} - \mu_{new} = 0$ is tested against the alternative H_A: $\mu_{old} - \mu_{new} > 0$. Which of the following would be a Type II error?
    a. Deciding that the new lenses are cheaper, when in fact they really are.
    b. Deciding that the new lenses are not really cheaper, when in fact they are.
    c. Deciding that the new lenses are cheaper, when in fact they are not.
    d. Deciding that the new lenses are not really cheaper, when in fact they are not.

15. Which of the following is not a characteristics of ex-post facto research design?
    a. The research has control or a comparison group
    b. The research focuses on the effects
    c. The research tries to analyze the 'how' and 'what' aspects of an event
    d. Ex-post facto research subjects are randomly assigned

16. Which of these is not a type of Focus group?
    a. Dual Moderator Group
    b. Creative Groups
    c. Sociometry Group
    d. Mini-Groups

17. Which of the following features are considered as critical in qualitative research?
    a. Collecting data with the help of standardized research tools.
    b. Design sampling with probability sample techniques.
    c. Collecting data with bottom-up empirical evidence.
    d. Gathering data with top-down schematic evidence.

18. 10–15 years; 16–20 years; 21 years and beyond is an example of
    a. Inclusive class interval
    b. Exclusive class interval
    c. Class interval
    d. None of the above

19. One where measurements are only approximations and are expressed in class intervals i.e. within certain limits is
    a. Continuous Frequency Distribution
    b. Discrete Frequency Distribution
    c. Cumulative Frequency Distribution
    d. All of these Frequency Distribution

20. The sample regression line estimated by OLS
    a. has an intercept that is equal to zero.
    b. is the same as the population regression line.
    c. cannot have negative and positive slopes.
    d. is the line that minimizes the sum of squared prediction mistakes

21. Even numbered non-verbal rating scale using single adjectives instead of bipolar opposites is called
    a. Semantic Differential
    b. Stapel Scale
    c. Multi-dimensional scaling
    d. Standardized Instruments

22. In a Systematic Literature Review, the step that ensures research transparency and replicability is:
    a) Broad reading without selection criteria
    b) Collecting only recent articles
    c) Use of explicit inclusion and exclusion criteria for selecting studies
    d) Summarizing articles using personal judgment

23. When referencing sources in APA style, an article with two authors should appear in-text as:
    a) (Brown and Taylor 2022)
    b) (Brown and Taylor, 2022)
    c) (Brown & Taylor, 2022)
    d) (Brown et al., 2022)

24. Which research approach progresses from general theory to specific observation?
    a) Inductive
    b) Deductive
    c) Comparative
    d) Exploratory

25. When the population is heterogeneous, the best probability sampling method is:
    a) Stratified random sampling
    b) Systematic sampling
    c) Random sampling
    d) Convenience sampling

26. A research instrument is called valid but not reliable when:
    a) It measures consistently but inaccurately
    b) It cannot be tested statistically
    c) It measures only nominal data
    d) It measures accurately but inconsistently

27. If respondents give socially desirable answers, this causes:
    a) Sampling error
    b) Response bias
    c) Processing error
    d) Non-response bias

28. Triangulation in mixed methods is used to:
    a) Reduce the sample size needed
    b) Replace the need for qualitative data
    c) Avoid the need for statistical testing
    d) Validate findings using multiple data sources or methods

29. In hierarchical clustering, the dendrogram is used to:
    a) Evaluate factor loadings
    b) Test goodness-of-fit
    c) Visualize the merging of clusters at various similarity levels
    d) Perform principal component extraction

30. Regression residuals represent:
    a) Explained variation
    b) Predictor interactions
    c) Standardized coefficients
    d) Unexplained variation

31. Confirmatory Factor Analysis (CFA) differs from exploratory factor analysis because CFA:
    a) Extracts factors without theoretical basis
    b) Uses eigenvalues to determine factor number
    c) Requires rotation methods
    d) Tests a hypothesized factor structure based on theory

32. In a one-way ANOVA, if the assumption of homogeneity of variance is violated, the most appropriate corrective approach is:
    a) Increase sample size to reduce variance differences
    b) Use Tukey's HSD post-hoc test
    c) Apply Welch's ANOVA instead of the standard F-test
    d) Convert all variables to categorical form

33. The Mann-Whitney U test is used instead of _____
    a) Chi-square
    b) Independent samples t-test
    c) Paired t-test
    d) ANOVA

34. A case study research design focuses on _____
    a) Large sample representation
    b) Inferential generalization
    c) Randomized control trials
    d) In-depth exploration of a single unit

35. Thematic analysis identifies _____.
    a) Variance across groups
    b) Factor loadings
    c) Patterns and themes within qualitative data
    d) Probability distributions

36. In academic report writing, plagiarism can occur even when _____.
    a) A source is cited exactly as written
    b) Permission is given by the original author
    c) Ideas are paraphrased but the original source is not credited
    d) Common knowledge facts are discussed

37. A research instrument is unbiased when it _____.
    a) Does not systematically favor one outcome
    b) Is lengthy
    c) Is administered online
    d) Uses Likert scale

38. Measurement error occurs when:
    a) Sample is large
    b) Observed value differs from true value

c) Data is qualitative
d) Regression is used

39. In cluster analysis, groups are formed based on:
a) Pattern similarity among observations
b) Random allocation
c) Hypothesis testing
d) Controlled variation

40. The KMO test is used to assess:
a) Sampling adequacy for factor analysis
b) Normality
c) Reliability
d) Independence

41. A factor with eigenvalue less than 1 is usually:
a) Retained
b) Discarded
c) Treated as dependent variable
d) Standardized

42. Structural Equation Modeling (SEM) allows for:
a) Analysis of multiple relationships among latent constructs
b) No measurement errors
c) Only univariate testing
d) Regression only

43. Ethical research reporting requires that results are:
a) Modified to please sponsors
b) Filtered to remove negative outcomes
c) Adjusted to match hypothesis
d) Reported honestly, without altering findings

44. The section of a research report where future research directions are mentioned is:
a) Abstract
b) Methodology
c) Conclusion/Recommendations
d) Literature Review

45. A conceptual framework in research primarily serves to:
a) Illustrate the relationships among key variables of the study based on theory and logic
b) Provide the detailed statistical tools for analysis
c) Present the final results of the study
d) Describe the historical background of the research problem

46. How is a research question related to a hypothesis?
a) Both are identical statements
b) A hypothesis is formed after data collection
c) A hypothesis is a tentative answer or prediction derived from a research question
d) Research questions are used only in qualitative studies

47. When should a researcher prefer a non-parametric test over a parametric one?
a) When sample size is large and data are normally distributed
b) When data violate normality or measurement level assumptions
c) When parameters of the population are known
d) When data are measured on an interval scale

48. An effective focus group generally consists of:
a) 2–3 participants with a moderator
b) 6–12 participants guided by a trained moderator

c) More than 30 participants for wide representation
d) There is no restriction for the group size

49. In a research study, the theoretical framework:
a) Is developed after data analysis
b) Is not related to the hypotheses
c) Replaces the need for hypotheses
d) Provides the basis for formulating hypotheses

50. The t-test:
a. Is essentially a two-tailed test.
b. Is essentially a one-tailed test.
c. Can be one-tailed as well as two-tailed depending on the hypotheses.
d. Can never be one tailed test.

Part B

51. A company's break-even point increases when:
a) Selling price per unit increases, variable cost remains constant
b) Contribution margin increases
c) Fixed costs increase while contribution per unit remains unchanged
d) Variable cost per unit decreases

52. Market efficiency in **semi-strong form** implies:
a) Prices reflect all public information
b) Prices reflect only past prices
c) Prices reflect all private information
d) Prices reflect insider trading effects

53. A firm with high working capital turnover typically indicates:
a) Excessive investment in current assets
b) Inefficient utilization of short-term funds
c) Efficient use of working capital to generate sales
d) High liquidity but low profitability

54. An investment plan of a mutual fund which is available for subscription and repurchase on a continuous basis, is called
a. close-ended scheme
b. balanced scheme
c. **open-ended scheme**
d. growth scheme

55. Interest rate risk is a type of:
a. Credit risk
b. **Market risk**
c. Operational risk
d. All the above

56. A bond has a 5.5% yield and a comparable Treasury security has yield of 3.75%. What is the relative yield spread?
a. 3.75% / 3.75% = 100%
b. **1.75% / 3.75%** = 46.66%
c. 2.50% / 3.75% = 66.66%
d. 5.50% / 3.75% = 146.66%

57. Cost of capital is less than
a. the cost of debt
b. Equal to the last dividend paid to the equity shareholders
c. Equal to the dividend expectations of equity shareholders for the coming year
d. **None of the above**

58. The capital budget is associated with
    a. Long-term and short-term assets
    b. Fixed assets
    c. Long terms assets
    d. Short term assets

59. An asset costing ₹2,00,000 with a residual value of ₹20,000 and a life of 4 years is depreciated using the **Sum-of-the-Years'-Digits method**. What is the depreciation for the first year?
    a. ₹45,000
    b. ₹60,000
    c. **₹72,000**
    d. ₹80,000

60. A product has selling price ₹100, variable cost ₹60, fixed cost ₹1,20,000. The Break-even point (in units) is:
    a. 1,200 units
    b. **3,000 units**
    c. 4,000 units
    d. 2,000 units

61. How many pairs are correctly matched?
    A. Fixed Exchange Rate – Determined by market forces only
    B. Floating Exchange Rate – Determined by demand and supply
    C. Managed Float – Partial intervention by the central bank
    D. Pegged Rate – Linked to a specific foreign currency

    a. **3**
    b. 2
    c. 4
    d. 1

62. A country's Balance of Payments (BoP) always balances because:
    a. Exports equal imports
    b. Government adjusts fiscal deficit
    c. Accounting identity ensures total debits = total credits
    d. IMF ensures equilibrium

63. In FDI, management control is:
    a. Retained by the host country
    b. Not transferred at all
    c. **Usually transferred to the foreign investor**
    d. Shared equally with WTO

64. Which of the following is NOT a marketing management skill
    a. **Information handling and management**
    b. Managing networks, relationships and interactions
    c. Analytical and creative skills
    d. Managing across the organisation

65. The holistic marketing framework is designed to address which three key management questions?
    a. Customer; cost; competition
    b. Segmentation; targeting; positioning
    c. Product; price; promotion
    d. **Value exploration; value creation; value delivery**

66. For a healthcare organisation, Repositioning can become necessary for four of the following reasons but NOT because _____.
    a. There is a need to change the perception of the firm in the minds of existing and potential customers
    b. There was an initial launch error
    c. New market categories appear
    d. **Customers are familiar with the product**

67. Which of the following is NOT normally regarded as a major influence on buyers' expectations?
    a. Past buying experience
    b. **Attractive packaging**
    c. Competitors' information and promises
    d. Marketers' information and promises

68. Customer satisfaction can be measured by four of the following methods but NOT by _____.
    a. **Store traffic counts**
    b. Periodic customer surveys
    c. Use of mystery shoppers
    d. Analysing customer complaints

69. A brand community is a group of people who share an interest in a specific brand and create a parallel social universe with its own values, ritual, vocabulary and _____
    a. Conversations
    b. Management
    c. Auditing
    d. **Hierarchy**

70. In distribution channel design, a major consideration is:
    a) Selecting the cheapest intermediaries only
    b) Eliminating all middlemen to reduce cost
    c) Balancing market coverage with cost efficiency
    d) Increasing channel length in all markets

71. The main purpose of channel conflict management is to:
    a) Increase the number of channel members
    b) Eliminate all independent intermediaries
    c) Provide exclusive territorial rights to wholesalers
    d) Reduce friction and improve coordination among channel partners

72. The critical path in project scheduling is the path:
    a) With the longest duration
    b) With the least cost
    c) With the most slack
    d) With the smallest variability

73. The bullwhip effect in supply chains refers to:
    a) Demand variability amplification as orders move upstream
    b) Inventory always reducing in transit
    c) Reduced supplier coordination
    d) Fixed procurement cycles

74. The Just-in-Time (JIT) approach in logistics aims to:
    a) Maintain large safety stocks
    b) Increase warehouse storage space
    c) Maximize lead times
    d) Reduce inventory levels by synchronizing production with demand

75. Scheduling is relatively simple and concerned with establishing a rate of output sufficient to meet sales forecasts in a _____ type of factory.

a. Repetitive focus
b. Mass customisation
c. Process focus
d. Product focus

76. Of the four tools used for process analysis and design, which one focuses on the customer interaction?
a. Time function mapping
b. Service blueprinting
c. Process charts
d. Flow diagrams

77. Industrial location analysis typically has a
a. Environmental focus
b. Labor focus
c. Cost focus
d. Revenue focus

78. The Lerner Index measures:
a) Consumer surplus
b) Supply elasticity
c) Degree of market power
d) Economies of scale

79. When the long-run average cost curve is declining over all output ranges, the firm exhibits:
a) Increasing returns to scale
b) Decreasing returns to scale
c) Constant returns to scale
d) Diseconomies of scale

80. Which of the following is included in the calculation of national income?
a) Transfer payments
b) Sale of second-hand goods
c) Financial investments such as purchase of shares
d) Value added by all producing units within the economy

81. In an organization, Enterprise Resource Planning (ERP) systems mainly help in:
a) Integrating information and processes across all functional areas
b) Restricting data access across departments
c) Reducing the need for employee collaboration
d) Eliminating strategic decision-making

82. The Digital Divide refers to:
a) Differences between online and offline marketing tools
b) The gap between outdated and the latest hardware technologies
c) The disparity in access to information and communication technologies across groups
d) Inequality in organizational data storage systems

83. In a Database Management System (DBMS), the term data redundancy refers to:
a) Data being stored in encrypted format
b) Data being completely deleted after use
c) Unnecessary repetition of the same data in multiple places
d) Storing data in a central server only

84. Public key encryption uses multiple keys. One key is used to encrypt data, while another is used to decrypt data. The key used to encrypt data is called the_____key, while the key used to decrypt data is called the_____key.
(a) Encryption, decryption
(b) **Public, private**
(c) Private, public
(d) Encryption, public

85. In MS Excel, C6:C8 means
(a) Cell C6 only
(b) Cells C6, C7, C8
(c) Cells C6 and C8 only
(d) None of these

86. In hypothesis testing, power of a test is:
a) Probability of Type I error
b) Probability of accepting null hypothesis
c) Probability of rejecting a false null hypothesis
d) Always equal to 1 - significance level

87. An ogive is primarily used to determine:
a) Mean of the distribution
b) Mode of the distribution
c) Median and percentiles of the distribution
d) Standard deviation of the distribution

88. If a data set is positively skewed:
a) Mean < Median < Mode
b) Mode < Median < Mean
c) Mean = Median = Mode
d) Mean < Mode < Median

89. Entrepreneurship contributes to economic development primarily by:
a) Increasing dependence on government subsidies
b) Limiting competition in the market
c) Controlling inflation through regulation
d) Promoting innovation and job creation

90. In India, which socio-cultural factor most strongly supports entrepreneurial growth?
a) High preference for government jobs
b) Increased acceptance of start-up failures as learning
c) Fear of social criticism for business risk
d) Low social mobility

91. Political stability and transparent regulatory systems primarily affect entrepreneurship through:
a) Encouraging speculative investment
b) Reducing perceived risk and improving investor confidence
c) Limiting market entry
d) Increasing taxation

92. The key objective of Entrepreneurial Development Programmes (EDPs) in India is to:
a) Train individuals to identify, plan, and manage business ventures effectively
b) Provide government employment to trainees
c) Encourage large-scale industrialization only
d) Replace financial institutions' functions

93. Which organization functions as an apex body for coordinating EDP activities in India?
a) NITI Aayog
b) NIESBUD (National Institute for Entrepreneurship and Small Business Development)
c) SEBI
d) MSME-DI

94. A meticulously prepared business plan serves multiple strategic purposes for an entrepreneur. However, its effectiveness is *limited* in which of the following ways?
a) **It cannot fully anticipate market disruptions and guarantee venture success**
b) It fails to outline funding requirements and investor expectations
c) It eliminates the need for managerial decision-making during execution
d) It restricts flexibility in operational adjustments

95. Which of the following is NOT a core dimension of Hofstede's cultural framework?
    a) Power Distance
    b) Uncertainty Avoidance
    c) Emotional Stability
    d) Long-Term Orientation

96. The halo effect in performance appraisal occurs when:
    a) One strong trait influences rating on all dimensions
    b) Past performance biases current ratings
    c) Raters compare employees to each other
    d) Ratings are inflated due to friendship

97. In Vroom's Expectancy Theory, the motivational force is calculated as:
    a) Valence × Instrumentality
    b) Expectancy × Valence × Instrumentality
    c) Expectancy + Valence
    d) Instrumentality ÷ Effort

98. Which leadership style is characterized by high concern for people and low concern for production?
    a) Impoverished (1,1)
    b) Team Management (9,9)
    c) Authority-Obedience (9,1)
    d) Country Club (1,9)

99. The Hawthorne Effect refers to:
    a) Improved performance due to increased lighting
    b) Fatigue reducing output over time
    c) Group norms overriding individual effort
    d) Workers' increasing productivity when observed

100. Which conflict resolution style results in a lose-lose outcome?
    a) Collaborating
    b) Compromising
    c) Avoiding
    d) Accommodating

Correct Option is marked in bold

Q1 A researcher conducted a study to have initial idea of scope and magnitude of the problem under study and to test the feasibility of more extensive research. Such a study is called:

a. Explanatory study

b. Confirmatory study

c. Descriptive study

d. Exploratory study

Q2 Research conducted after the carefull inquiry is known as:

a. Applied research

b. Action research

c. Applied research and Action research both

d. Fundamental research

Q3 What is the correct sequence of actions in conducting intervention-based action research in Education?

a. Act, observe, plan and reflect

b. Plan, act, observe and reflect

c. Observe, plan, reflect and act

d. Reflect, observe, plan and act

Q4 Applied research includes which of the following?

a. Clinical Research

b. Case Studies

c. Research and Development (R&D)

d. All of the above

Q5 Which of the following best describes the nature of applied research?

a. It is conducted purely for theoretical understanding.

b. It is aimed at solving practical problems.

c. It is done only by scientists in laboratories.

d. It does not use scientific methods.

Q6 Selecting only female participants for a study to eliminate gender as a potential influencing factor is an example of:

a. Holding an intervening variable constant.

b. Random selection.

c. Statistical control.

d. Counterbalancing

Q7 In which of the following research methods, process of hypothesis testing optimally safeguards the role of extraneous variables?

a. Ex-post Facto method

b. Experimental method

c. Historical method

d. Descriptive Survey method

Q8 What type of research explores new facts through the study of the past?

a. Mythological research

b. Content analysis

c. Historical research

d. Philosophical research

Q9 Ethnography does not include

a. Field Notes

b. Objective Analysis

c. Participant Observation

d. Value Neutrality

Q10 Which of the following is an example of qualitative research?

a. Experimental research

b. Ex post facto research

c. Descriptive survey research

d. Grounded theory research

Q11 Which of the following methods is used in empirical researches?

a. Inductive method

b. Deductive method

c. Initiative method

d. Scientific method

Q12 Which scale is the simplest form of measurement?

a. Ordinal

b. Interval

c. Ratio

d. Nominal

Q13 In which scale of measurement, classification, order and equality of units are ensured?

a. Ordinal

b. Nominal

c. Interval

d. Ratio

Q14 If a research project is set up so that everybody in the population of interest has an equal chance of being included in the sample, the research involves:

a. quota sampling

b. judgmental sampling

c. probability sampling

d. convenience sampling

Q15 A college principal conducts an ethnographic probe into the problems faced by tribal students. Which method of sampling will be most appropriate?

a. Random sampling

b. Stratified sampling

c. Cluster sampling

d. Systematic sampling

Q16 Variation of sample mean from the population mean is due to:

a. Sampling error

b. Wrong method of data collection

c. Biased attitude of the researcher

d. All of the above

Q17 The Ansari-Bradley test is a type of:

a. Parametric test

b. Non-parametric test

c. Regression analysis

d. Time series analysis

Q18 A researcher uses systematic random sampling from a company directory that has 600 employees listed in alphabetical order. If the desired sample size is 30, and the first name to be selected is number 8, which of the following will not be selected?

a. 88

b. 368

c. 428

d. 558

Q19 The arithmetic mean of the following frequency distribution of number of accidents X on week working days is:

X:	2	4	6	8	10	12
Frequency:	3	4	2	1	4	2

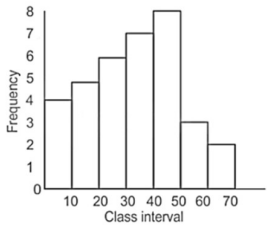
a. 4.625

b. 6.625

c. 7.625

d. 8.325

Q20 A histogram has 7 bars of varying heights. The fifth bar represents the maximum frequencies. The range of this frequency distribution table can be classified as _____



a. Average

b. Below average

c. Above average

d. Extreme

Q21 A distribution with a kurtosis less than 3 is known as:

a. Platykurtic

b. Mesokurtic

c. Leptokurtic

d. Hyperkurtic

Q22 If the data are skewed, which option of central tendency measure is the most unreliable indicator?

a. Mean

b. Median

c. Range

d. Mode

Q23 Find the median of the given set of numbers 2, 6, 6, 8, 4, 2, 7, 9.

a. 6

b. 8

c. 4

d. 5

Q24 If mean and mode of some data are 4 and 10 respectively, its median will be:

a. 1.5

b. 4

c. 6

d. 7

Q25 What is the standard deviation of the given data?

3, 8, 4, 5, 9, 13

a. 5.12

b. 2.55

c. 4.82

d. 3.41

Q26 The mean and standard deviation of 10 observations are 20 and 8 respectively. Later on, it was observed that one observation was recorded as 50 instead of 40. Then the correct variance is:

a. 14

b. 13

c. 12

d. 11

Q27 The coefficients of variation of two distributions are 75 and 80, and their standard deviations are 15 and 16, respectively. What are their arithmetic means?

a. 5 and 5, respectively

b. 5 and 6, respectively

c. 20 and 20, respectively

d. 500 and 500, respectively

Q28 In which of the following acts, researcher does not maintain research ethics?

a. Convert interval scale data into ordinal scale data to apply non-parametric test

b. Does not disseminate the findings of research

c. Shares confidential information of the subjects with others

d. Collects data from secondary sources

Q29 The approach where sensitive information about the study is withheld from participants but no false information is provided is called:

a. Active Deception

b. Confidentiality

c. Full Disclosure

d. Passive Deception

Q30 Plagiarism in research is:

a. Creative use of previous data

b. Copying unscrupulously and making use of it

c. Quoting someone and citing him/her

d. Referring to previous data and working over it with new objectives

Q31 Under the Quality Mandate of UGC, the acronym 'CARE' stands for

a. Commission for Academic and Research Ethics

b. Cantre for Academic Research and Ethics

c. Consortium for Academic and Research Ethics

d. Computer-Aided Research and Education

Q32 The term 'Intellectual Property Rights' relates to

a. Copyrights

b. Know-how

c. Trade dress

d. All of the above

Q33 Intellectual Property Rights (IPRs) protect the use of information and ideas that are of

a. Social value

b. Commercial value

c. Ethical value

d. Moral value

Q34 Which among the following is not a correct statement regarding patent?

a. A patent is a legal protection granted for an invention that is new, non-obvious and useful.

b. The patent grants the patent holder the exclusive right to make use or sell the patented products or process.

c. The exclusive purpose of the patent system is to benefit the patent holder.

d. The Indian Patent Act, 1970, was amended and made effective from January 1, 2005

Q35 The goodness of fit of a distribution is tested by:

a. By T test

b. By chi-square test

c. By F test

d. By all of these

Q36 Determine the correct sequence of the steps involved in the process of hypothesis testing.

A. Setting the null and alternative hypothesis

B. Setting the level of significance

C. Determining the appropriate statistical test

D. Setting the decision rule

E. Analysing the collected data

Choose the correct answer from the options given below:

a. B, A, C, D, E

b. B, C, A, D, E

c. A, C, B, D, E

d. A, B, C, D, E

Q37 Using a 'goodness of fit' test, we can assess whether a set of obtained frequencies differ from a set of _____.

a. Actual frequencies

b. Expected frequencies

c. Normal frequencies

d. Ideal frequencies

Q38 Type - I error is an error caused by:

a. Accepts null hypothesis when it is false

b. Rejects null hypothesis when it is true

c. Accepts null hypothesis when it is true

d. Rejects null hypothesis when it is false

Q39 Using equivalent samples, a researcher obtained a significant correlation 95 times out of 100 trials. He/She decided to reject the null hypothesis. The alpha level would be:

a. 0.05

b. 0.01

c. 0.02

d. 0.001

Q40 An investigator used t-test to compare two groups of students on verbal aptitude. He repeated his experiment 20 times and obtained significant difference 19 times. On the basis of this he decided to reject the null hypothesis. The probability of committing type I error was

a. 0.01

b. 0.02

c. 0.05

d. 0.10

Q41 Which of the following is caused by careless handling of experimental set up?

a. Systematic error

b. Gross error

c. Random error

d. None of these

Q42 Fisher's index number does not satisfy:

a. Unit test

b. Time reversal test

c. Circular test

d. Factor reversal test

Q43 Which of the following sequences correctly represents the steps of research using a quantitative paradigm?

a. Hypothesis framing, Hypothesis testing, Conclusions and Reporting.

b. Establishing a research problem, Hypothesis framing, Hypothesis testing, Generalization and Conclusions and Implications of result

c. Problem identification, Sample selection, Developing a research design and Field work.

d. Defining a problem, Survey of related studies, Sampling, Data collection and Data analysis

Q44 The combination of different approaches to validate information, strategies, and results in a research study is technically known as:

a. Meta analysis

b. Triangulation

c. Trend analysis

d. Cross validation

Q45 The following table shows the growth of a bacterial colony over time

Time (Hrs)	Number of Bacteria
0	100
1	200
3	800
4	1600
7	12800

Which of the following equations best models the data?

a. $y = 100 \cdot 2^x$

b. $y = 100 \cdot 3^x$

c. $y = 100x^2$

d. $y = 100x + 100$

Q46 If the mode of the following data is 7, then the value of k in the data set 3, 8, 6, 7, 1, 6, 10, 6, 7, 2k + 5, 9, 7, and 13 is:

a. 3

b. 7

c. 4

d. 1

Q47 Three rotten apples are mixed accidently with seven good apples and four apples are drawn one by one without replacement. Let the random variable X denote the number of rotten apples. If μ and σ^2 represent mean and variance of X, respectively, then $10(\mu^2 + \sigma^2)$is equal to

a. 20

b. 250

c. 25

d. 30

Q48 The coefficient of correlation is the _____ of coefficients of regression

a. Reciprocal of product.

b. Arithmetic mean.

c. Geometric mean.

d. Harmonic Mean

Q49 Coefficient of variations of two distributions are 55 and 65 and their standard deviations are 22 and 39 respectively. Their arithmetic means are respectively.

a. 15, 20

b. 40, 60

c. 30, 50

d. 20, 40

Q50 Write the following steps of sampling procedure in a correct order.

(A) Preparing sampling frame

(B) Applying the sampling technique

(C) Administer the tool

(D) Define the universe to be studied

Choose the correct answer from the options given below

a. (A), (D), (B), (C)

b. (D), (A), (B), (C)

c. (A), (D), (C), (B)

d. (D), (A), (C), (B)

Q51 A steel bar of 5 mm is heated from 12^0C to 55^0C and it is free to expand. The bar will induce:

a. **No stress**

b. Shear stress

c. Tensile stress

d. Compressive stress

Q52 Which of the following is a dimensionless quantity?

a. Shear stress

b. Bulk modulus

c. **Poisson's ratio**

d. Shear modulus

Q53 Percentage elongation during tensile test is indicative of

a. creep

b. malleability

c. **ductility**

d. elasticity in the metal

Q54 A composite bar is made from one copper strip of 5 mm thickness in between 2 steel strips of 5 mm thickness each. The length of the bar is 2 m. Width of the bar is 20 mm. The composite bar hung vertical, is subjected to an axial load of 60 kN, Es = $2x10^5$ N/ mm^2, Ec =1x105 N/mm^2 . The relation between stresses (σ_s and σ_c) will be

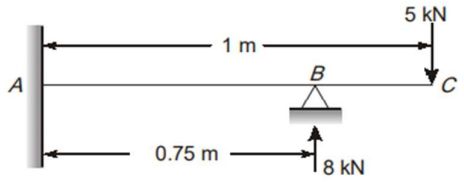
a. **$\sigma_s = 2\sigma_c$**

b. $\sigma_s = \sigma_c$

c. $\sigma_s = \sigma_c /2$

d. $\sigma_s = 4\sigma_c$

Q55 A horizontal beam ABC is shown in the given figure. The distance of the point of contraflexure from the fixed end A is



a. **0.333m**

b. 0.666m

c. 0.25m

d. 0.7m

Q56 Proof resilience in a member is stored strain energy:

a. per unit volume

b. **in whole volume**

c. per unit area

d. per unit length

Q57 The ability of a tool material to resist shock or impact forces is known as :

a. wear resistance

b. **toughness**

c. red hardness

d. Machinability

Q58 Steel containing less than 0.8% carbons are called _____ and those which contain more than 0.8% carbons are called _____.

a. **hypoeutectoid, hypereutectoid**

b. hypoeutectoid, austenite

c. hypereutectoid, hypoeutectoid

d. hypereutectoid, austenite

Q59 The taper provided on pattern for its easy and clean withdrawal from the mould is called

a. taper allowance

b. **draft allowance**

c. distortion allowance

d. pattern allowance

Q60 Which of the following is not a casting defect?

a. Hot tear

b. Blow hole

c. Scab

d. **Decarburisation**

Q61 The vertical passage for bringing molten metal to mould cavity is called:

a. Riser

b. **Sprue**

c. Runner

d. Gate

Q62 Facing sand used in foundry work comprises of

a. alumina, silica and clay

b. **silica and clay**

c. silica and alumina

d. clay and alumina

Q63 Which of the following engineering materials is the most suitable candidate for hot chamber die casting?

a. Low carbon steel

b. Titanium

c. Copper

d. **Tin**

Q64 Arrange the processes in the increasing order of their maximum material removal rate.

Electrochemical machining (ECM),

Ultrasonic machining (USM)

Electron beam machining (EBM)

Laser beam machining (LBM) and

Electric discharge machining (EDM)

a. USM, LBM, EBM, EDM, ECM

b. EBM, LBM, USM, ECM, EDM

c. LBM, EBM, USM, ECM, EDM

d. LBM, EBM, USM, EDM, ECM

Q65 Cutting tool is much harder than the workpiece. Yet the tool wears out during the tool-work interaction, because

a. Extra hardness is imparted to the workpiece due to coolant used

b. **Extra hardness is imparted to the workpiece due to severe rate of strain**

c. Vibration is induced in the machine tool

d. Oxide layers on the workpiece surface impart extra hardness to it

Q66 Which pair of following statements is correct for orthogonal cutting using a single-point cutting tool?

P: Reduction in friction angle increases cutting force

Q: Reduction in friction angle decreases cutting force

R: Reduction in friction angle increases chip thickness

S: Reduction in friction angle decreases chip thickness

a. P and R

b. P and S

c. Q and R

d. **Q and S**

Q67 In EDM process tool is made up of

a. Tungsten Carbide

b. Heat-treated alloy steel

c. Diamond

d. **Brass**

Q68 Flash and gutter are provided in drop forging dies at the following stage:

a. Blocking

b. Preforming

c. **Finishing**

d. Fullering

Q69 Wrinkling is a common defect found in:

a. Bent components

b. **Deep drawn components**

c. Embossed components

d. Blanked component

Q70 In turning operation, the feed could be doubled to increase the metal removal rate. To keep the same level of surface finish, the nose radius of the tool should be:

a. Halved

b. Kept unchanged

c. Doubled

d. **Made four times**

Q71 Tool life testing on a lathe under dry cutting conditions gauge n and C of Taylor tool life equation as 0.12 and 130 m/min. respectively. When a coolant was used, C increased by 10%. The increased tool life with the use of coolant at a cutting speed of 90 m/min is:

a. **47.4 min**

b. 37.4 min

c. 27.4 min

d. 17.4 min

Q72 A solid circular shaft of 40 mm diameter transmits a torque of 3200 N-m. The value of the maximum stress developed is:

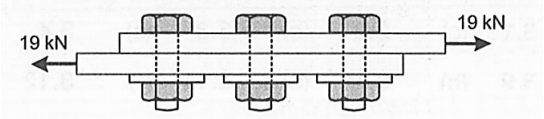
a. $400/\pi$

b. $\mathbf{800/\pi}$

c. $1600/\pi$

d. $600/\pi$

Q73 For the three bolt system shown in the figure, the bolt material has shear yield strength of 200 MPa. For a factor of safety of 2, the minimum metric specification required for the bolt is



a. M 8

b. **M10**

c. M12

d. M16

Q74 Ball bearings are rated by a manufacturer for a life of 10^6 revolutions. The catalogue rating of a particular bearing is 16 kN. If the design load is 2 kN, the life of the bearing will be p x 10^6 revolutions, where p is equal to

a. **512**
b. 540
c. 585
d. 676

Q75 For full depth of involute spur gears, minimum number of teeth of pinion to avoid interference depends upon:

a. **pressure angle**
b. speed ratio
c. circular pitch
d. pitch diameter

Q76 Aircraft body is usually fabricated by:

a. Welding
b. Precasting
c. **Riveting**
d. Casting

Q77 In a horizontal flat belt drive, it is customary to use:

a. the bottom side of the belt as the slack side during the transmission of power
b. **top side of the belt as the slack side**
c. crossed belting
d. idler in between

Q78 The most commonly used criteria for measuring forecast error is

a. Mean absolute deviation
b. Mean absolute percentage error
c. Mean standard error
d. **Mean square error**

Q79 If at the optimum in a linear programming problem, a dual variable corresponding to a particular primal constraint is zero, then it means that:

a. **Right hand side of the primal constraint can be altered without affecting the optimum solution**
b. Changing the right hand side of the primal constraint will disturb the optimum solution

c. The objectives function is unbounded

d. The problem is degenerate

Q80 A firm is required to procure three items (P, Q, and R). The prices quoted for these items (in Rs.) by suppliers S1, S2 and S3 are given in table. The management policy requires that each item has to be supplied by only one supplier and one supplier supply only one item. The minimum total cost (in Rs.) of procurement to the firm is

Item	Supplier		
	S1	S2	S3
P	110	120	130
Q	115	140	140
R	125	145	165

a. 350

b. 360

c. **385**

d. 395

Q81 In PERT, the distribution of activity times is assumed to be

a. Normal

b. Gamma

c. **Beta**

d. Exponential

Q82 The project activities, precedence relationships and durations are described in the table. The critical path of the project is

Activity	Precedence	Duration (in days)
P	-	3
Q	-	4
R	*P*	5
S	*Q*	5
T	*R, S*	7
U	*R, S*	5
V	*T*	2
W	*U*	10

a. P-R-T-V

b. Q-S-T-V

c. P-R-U-W

d. **Q-S-U-W**

Q83 In a single server infinite population queuing model. Arrivals follow a Poisson distribution with mean A = 4 per hour. The service times are exponential with mean service time equal to 12 minutes. The expected length of the queue will be:

a. 4
b. **3.2**
c. 1.25
d. 24.3

Q84 SIMO charts are used in:

a. Method study
b. **Micromotion study**
c. Process analysis
d. Layout

Q85 Gannt chart gives the information about:

a. Breakeven point analysis
b. Material handling layout
c. **Production schedule**
d. Determining selling price

Q86 While scheduling decisions, the most influencing parameter is:

a. market research
b. **sales forecasting**
c. competitor pricing
d. availability of skilled personnel

Q87 The primary purpose of job rating or evaluation is to:

a. provide benefits like leave and housing
b. assess an employee's performance
c. motivate employees for higher production
d. **determine the relative worth of different jobs**

Q88 In job shop scheduling, which sequence of operations typically results in optimal resource utilization and minimization of job waiting times?

a. First In, First Out (FIFO)
b. **Shortest Processing Time (SPT) first**
c. Earliest Due Date (EDD)
d. Longest Processing Time (LPT) first

Q89 Which one of the following is NOT a decision taken during the aggregate production planning stage?

a. **Scheduling of machines**
b. Amount of labour to be committed
c. Rate at which production should happen
d. Inventory to be carried forward

Q90 A manufacturer has the following data regarding a product:

Fixed cost per month = Rs. 50000

Variable cost per unit = Rs.200

Selling price per unit = Rs.300

Production capacity = 1500 units per month

If the production is carried out at 80% of the rated capacity that the monthly profit (in Rs.) is _____

a. 60000
b. 70000
c. 80000
d. 90000

Q91 Statistical quality control techniques are based on the theory of

a. **Probability**
b. Quality
c. Statistics
d. Set theory

Q92 The activity with minimum _____ should be crashed first.

a. **cost slope**
b. cost index
c. crash cost
d. normal cost

Q93 Slack represents the difference between the:

a. Proposed allowable time and the earliest expected time
b. Normal allowable time and the latest expected time
c. Latest allowable time and the normal expected time
d. **Latest allowable time and the earliest expected time**

Q94 Which control chart will look for the control for the dispersion?

a. P chart

b. x bar chart

c. C chart

d. **R chart**

Q95 A project has six activities (A to F) with respective activity durations of 7, 5, 6, 6, 8, 4 days. The network has three paths: A-B, C-D and E-F. All the activities can be crashed with the same crash cost per day. The number of activities that need to be crashed to reduce the project duration by 1 day is

a. 1

b. 2

c. **3**

d. 6

Q96 In a single-channel queuing model, the customer arrival rate is 12 per hour and the serving rate is 24 per hour. The expected time that a customer is in queue is _____ minutes.

a. 1.25

b. **2.5**

c. 4.5

d. 6

Q97 Simplex method of solving linear programming problem uses:

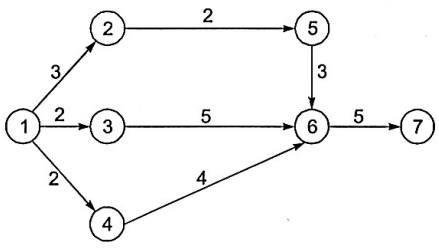
a. all the points in the feasible region

b. **only the corner points of the feasible region**

c. intermediate points within the infeasible region

d. only the interior points in the feasible region

Q98 Consider the given project network, where numbers along various activities represent normal time. The free float on activity 4-6 and the project duration, respectively, are



a. **2 and 13**

b. 0 and 12

c. 4 and 13

d. 2 and 12

Q99 The word kanban is most appropriately associated with:

a. economic order quantity

b. **just-in-time production**

c. capacity planning

d. product design

Q100 VED analysis of inventory control stands for:

a. Value, Engineering and Desirable

b. Value, Essential and Desirable

c. **Vital, Essential and Desirable**

d. Value, Essential and Demand

Correct Option is marked in bold

Q1 The matrix A is represented as $\begin{bmatrix} 2 & 3 \\ -1 & 4 \\ 10 & 3 \end{bmatrix}$. The transpose of the matrix of this matrix is represented as?

a. $\begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix}$

b. $\begin{bmatrix} 3 & 4 \\ 2 & -1 \end{bmatrix}$

c. $\begin{bmatrix} 3 & 2 \\ 4 & -1 \\ 3 & 10 \end{bmatrix}$

d. $\begin{bmatrix} \mathbf{2} & \mathbf{-1} & \mathbf{10} \\ \mathbf{3} & \mathbf{4} & \mathbf{3} \end{bmatrix}$

Q2 Given the equations are 4x+2y+z=8, x+ y+ z=3, 3x+y+3z=9. Find the values of x, y and z.

a. 5/3, 0, 2/3

b. 1, 2, 3

b. 4/3, 1/3, 5/3

c. 2, 3, 4

Q3 What is value of $\frac{dy}{dx}$ if x-y = 1?

a. 1

b. 2

c. -1

d. 2

Q4 Function f should be _____ on [a, b] according to Rolle's theorem.

a. continuous

b. non-continuous

c. integral

d. non-existent

Q5 What is the order of the differential equation given by $\frac{dy}{dx} + 4y = sinx$

a. 0.5

b. 1

c. 2

d. 0

Q6 Consider the $f(x, y) = x^2 + y^2 – a$. For what values of a do we have critical points for the function.

a. Independent of a

b. for any real number except zero

c. $a \in (0, +\infty)$

d. $a \in (-1, 1)$

Q7 Find $\frac{\partial z}{\partial x}$ where $z=ax^2+2by^2+2bxy$.

a. 3by

b. 2ax

c. 3(ax+by)

d. 2(ax+by)

Q8 A circle in which sectors represents various quantities is called……..

a. Histogram

b. Frequency Polygon

c. **Pie chart**

d. Component bar chart

Q9 A statement made about a population for testing purpose is called?

a. Statistic

b. Level of Significance

c. Test-Statistic

d. **Hypothesis**

Q10 Scatter diagram is graphical component of _____

a. Regression analysis

b. Demand

c. Supply

d. Profit

Q11 Descriptive statistics is used _____

a. To develop information regarding the product sample using the measured data

b. To measure the data for a sample

c. To draw conclusions about the population

d. To control the variation

Q12 Mean of a constant 'a' is _____

a. 0

b. a

c. a/2

d. 1

Q13 Variance of a random variable X is given by _____

a. E(X)

b. $E(X^2)$

c. $E(X^2) - (E(X))^2$

d. $(E(X))^2$

Q14 If the standard deviation of a data is 0.012. Find the variance.

a. 0.144

b. 0.00144

c. 0.000144

d. 0.0000144

Q15**.** Normal Distribution is applied for _____

a. Continuous Random Distribution

b. Discrete Random Variable

c. Irregular Random Variable

d. Uncertain Random Variable

Q16 _____ is the right granted by a government to an inventor to prevent others from the commercial use of his invention.

a. Piracy

b. Ethics

c. Biosafety

d. **Patents**

Q17 Which of the following acts are considered as unethical in research?

a. Using a ethnically prejudiced epithet in the laboratory
b. Sabotaging someone's work
c. Stealing supplies, books, or data
d. **All above**

Q18 The act of publishing the same data and results in more than one journal or publication refers to which of the following professional issues.

a. partial publication
b. **duplicate publication**
c. deception
d. full publication

Q19 Concerning 'authorship' in educational research, intellectual ownership is predominantly a function of

a. effort expended
b. professional position
c. **creative contribution**
d. level of higher education

Q20 A set of principles to guide and assist researchers in deciding which goals are most important and in conflicting values when conducting research is called ……

a. **Research ethics**
b. deontological approach
c. utilitarianism
d. none of these

Q21 Which of the methods is direct method for solving simultaneous algebraic equations?

a. Jacobi's method
b. Relaxation method
c. **Cramer's rule**
d. Gauss seidel method

Q22 What do we call the matrices obtained by changing rows and columns?

a. rectangular matrix
b. **transpose**

c. symmetric

d. scalar

Q23 What is the order of the matrix with m rows and n columns?

a. m + n

b. n x n

c. m x m

d. **m x n**

Q24 What is the order of the matrix [2 4 3]?

a. **1 × 3**

b. 3 × 1

c. 1 × 1

d. 3 × 3

Q25 What are/is the conditions to satisfy Lagrange's mean value theorem?

a. f is continuous on [a,b]

b. f is differentiable on (a,b)

c. **f is differentiable and continuous on (a,b)**

d. f is differentiable and non-continuous on (a,b)

Q26 What is the mathematical expression for the definition of continuity?

a. $\lim_{x\to c} f(x) = f(c)\ \forall\ c \in a$

b. **$\lim_{x\to c} f(x) = f(c)\ \forall\ c \in (a, b)$**

c. $\lim_{x\to c} f(x) = f(c)\ \forall\ c \in b$

d. $\lim_{x\to a} f(x) = f(c)\ \forall\ c \in (a, b)$

Q27 Find $\frac{\partial z}{\partial x}$ where $z=\sin x^2 \times \cos y^2$.

a. $2x\sin x^2$

b. x sin2x

c. **$2x\sin x^2 \cos y^2$**

d. $6x\sin x^2 \cos y^2$

Q28 What is the order of the differential equation, y"+y'-x3y=sinx?

a. **2**

b. 1

c. 0

d. 3

Q29 Which of the following is not an example of a linear differential equation?

a. y=mx+c

b. x+x'=0

c. $x+x^2=0$

d. x"+2x=0

Q30 What is the equation of the tangent at a specific point of $y^2 = 4ax$ at (0, 0)?

a. **x = 0**

b. x = 1

c. x = 2

d. x = 3

Q31 Find the Eigenvalue for the given matrix.

$$A=\begin{bmatrix}4 & 1 & 3\\ 1 & 3 & 1\\ 2 & 0 & 5\end{bmatrix}$$

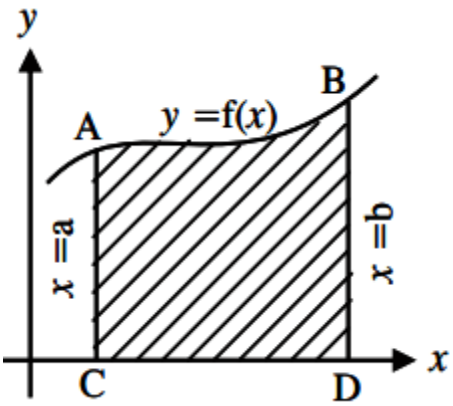
a. 13

b. -3

c. **7.1**

d. 8.3

Q32 What is the formula used to find the area surrounded by the curves in the following diagram?



a. $\int_a^b \boldsymbol{ydx}$

b. $\int_a^b -ydx$

c. $\int_a^b xdx$

d. $\int_a^b -xdx$

Q33 By using the method of separation of variables, the determination of solution to a partial differential equation reduces to the determination of solution to ……

a. Ordinary differential equation

b. Higher order partial differential equation

c. Linear equation

d. None of the above

Q34 Science dealing with the collection, analysis, interpretation, and presentation of numerical data is called _____.

a. Physical science

b. chemical science

c. statistics

d. social science

Q35 If data are used to reach conclusions only about the group from which the data aregathered, then the statistics are referred to as _____ statistics.

a. Descriptive

b. inferential

c. Inductive

d. Nominal

Q36 The following data represents the number of printer ribbons used annually in a company by twenty-eight departments. This is an example of _____ data.

8 4 5 10 6 5 4 6 3 4 4 6 1 12

2 11 2 5 3 2 6 76 12 7 1 8 9

a. grouped data

b. ungrouped data

c. midpoint

d. range

Q37 Which among the following is not a Measure of Central Tendency in Ungrouped Data?

a. Mean

b. Percentiles

c. Quartiles

d. Variance

Q38 Which of the following is considered in Measures of Shape

a. Skewness

b. mean

c. median

d. mode

Q39 The peakedness of a distribution is called _____.

a. Kurtosis

b. Outliers

c. Deviations

d. Absolute Value

Q40 Data values that lie outside the mainstream of values in a distribution are referred to as _____.

a. Distribution

b. Absolute Value

c. Outliers

d. Median

Q41 When a statistic taken from the sample is used to estimate a population parameter, it is called a(n) _____ estimate.

a. Point

b. Interval

c. Degrees of Freedom

d. variance

Q42 When a range of values is used to estimate a population parameter, it is called a(n) _____ estimate.

a. Point

b. Degrees of Freedom

c. variance

d. Interval

Q43 Generally, when estimating a population mean and the population standard deviation is not known, you should use the _____ statistic.

a. z

b. t

c. Chi-square

d. none of the above

Q44 The first step in testing a hypothesis is to establish a(n) _____ hypothesis and a(n) _____ hypothesis.

a. negative, positive

b. Null, Alternative

c. upper, lower

d. left, right

Q45 In testing hypotheses, the researcher initially assumes that the _____ hypothesis is true.

a. Critical

b. Rejection

c. non-Rejection

d. Null

Q46 The region of the distribution in hypothesis testing in which the null hypothesis is rejected is called the _____ region.

a. Null
b. Critical
c. Rejection
d. non-Rejection

Q47 The rejection and acceptance regions are divided by a point called the _____value.

a. Null
b. Critical
c. Rejection
d. non-Rejection

Q48 A statement made about a population for testing purpose is called?

a. Statistics
b. Hypothesis
c. Level of significance
d. Test statistic

Q49 Plagiarism can be defined as

a. representing another person's work--their words and/or ideas--as your own.
b. not acknowledging the sources your ideas build upon.
c. paraphrasing another's ideas with explicit attribution to the author.
d. a and b

Q50 What is the best-suited name for a process that doesn't necessitate experimental research?

a. Manipulation
b. Controlling
c. Content analysis
d. Observation

Q51 What will be the value of R when it is expressed in cal /mol K ?

a. 1.987
b. 3.078
c. 4.045
d. 5.678

Q52 to 54 are linked questions. So do not change their sequence.

1000 kg of mixed acid of composition 40% H2SO4, 45% HNO3 and 15% H2O is to be produced by strengthening waste acid of composition 30% H2SO4, 36% HNO3 and 34% H2O by weight. Concentrated sulphuric acid of strength 95% and concentrated nitric acid containing 80% are available for this purpose. How many kilograms of waste acid and concentrated acids are to be mixed together?

Q52 Amount of waste acid

a. 70.22

b. 80.32

c. 62.23

d. 52.23

Q53 Amount of conc sulfuric acid

a. 398.88

b. 100.23

c. 88.82

d. 66.23

Q54 Amount of conc. nitric acid

a. 530.90

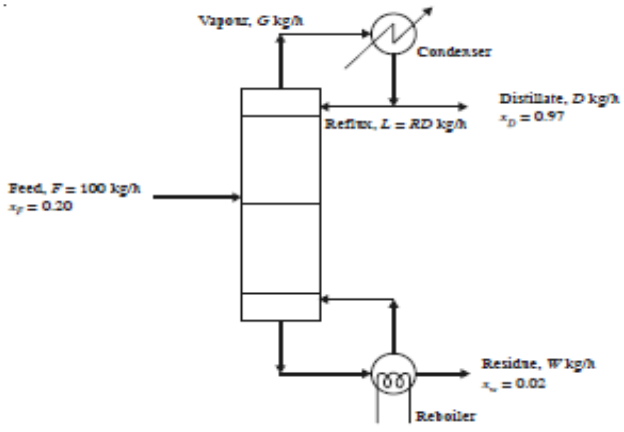
b. 422.32

c. 452.36

d. 322.36

Q 55 to 57 are linked questions.

An aqueous solution of methanol containing 20% (weight) methanol is to be separated into a distillate product containing 97% (weight) methanol and a bottom product containing 2% (weight) methanol. For treating 100 kg of feed with a reflux ratio of 3.5 on a weight basis, calculate



Q55 The amounts of distillate

a. 16.16

b. 18.95

c. 22.42

d. 21.26

Q56 The amount of vapour condensed in the condenser per kg of distillate

a. 4.5

b. 2.3

c. 3.8

d. 8.5

Q57 The amount of vapour condensed in the condenser per kg of feed

a. 0.625

b. 0.385

c. 0.231

d. 0.853

Q58 For a reaction, $A(g) + B(g) \rightarrow 2C(g)$; rate = $kC_A^2C_B$, if the volume of the reaction vessel is doubled, the rate of the reaction

a. will diminish to ¼ of initial value

b. will diminish to 1/8 of initial value

c. will grow 4 times

d. will grow 8 times

Q59 For the reaction, $A \rightarrow B$; at a particular time t, the rate of formation of B in the reaction, r_B, is 10 mole/L*min. Which of the following is true? (i) The rate of disappearance of B is -10 moles/L*min (ii) The rate of formation of A is -10 mole/L*min (iii) The rate of disappearance of A is 10 moles/L*min

a. (i) and (ii)

b. (i) and (iii)

c. (ii) and (iii)

d. ALL

Q60 For every 10°C rise in temperature, the rate of chemical reaction doubles. When the temperature is increased from 30 to 70°C, the rate of reaction increases _____ times

a. 16

b. 8

c. 12

d. 32

Q61 Which of the following is not an example of rate law?

a. $(r_A)^2 = k/C_A$

b. $r_A = -kC_A^{1/2}$

c. $r_A = kC_A^{1/2} + kC_A$

d. $\boldsymbol{r_A = -k\, dC_A/dt}$

Q62 For the uni-molecular type elementary reactions $A \overset{k1}{\rightarrow} B \overset{k2}{\rightarrow} C$; the fractional yield of *B* in CSTR for the given conversion of *A*

a. Remains constant with increase in k_2/k_1

b. Increases with increase in k_2/k_1.

c. Decreases with increase in $\boldsymbol{k_2/k_1}$.

d. None of these

Q63 The variance of C-curve from an RTD experiment was calculated to be 0.2. Using a 'tank in series model', the number of CSTRs required would be _____.

a. 2

b. 0.5

c. 0.2

d. 5

Q64 A first order reaction (with no change in volumetric flow rate) is carried out in ten equal sized CSTRs connected in series and operating at the same temperature. Space time of a CSTR is 2 min and rate constant is 0.5 min^{-1}. The conversion obtained after the second reactor would be

a. 75%

b. 50%

c. 25%

d. 10%

Q65 The Second law of thermodynamics is defined as the rate of internal generation of entropy within the system (S_{gen}) is

a. = 0

b. ≤ 0

c. >0

d. ≥ 0

Q66 The thermal efficiency of a Carnot engine (an ideal engine) has maximum efficiency working between two temperatures. The value of the thermal efficiency always must be

a. 1.0

b. <1.0

c. = 1.0

d. 100%

Q67 A central power plant rated at 800000 kW generates steam at 585K and discards heat to a river at 295 K. If the thermal efficiency of the plant is 70% of the maximum possible value, the actual thermal efficiency of the plant is:

a. 0.4957

b. 0.7270

c. 0.3227

d. **0.3470**

Q68 A refrigerator consumed the power of 1.65 kJ/s and its cooling rate is 4.22 kJ/s. The coefficient of performance of this refrigeration cycle is:

a. **2.5576**

b. 0.3928

c. 1.3928

d. 3.5454

Q69 For an ideal binary liquid mixture, the activity coefficient of each component is/are

a. (0)

b. **(1.0)**

c. (1and 2.0)

d. <1.0

Q70 The ratio of the change in the temperature of the gas as a result of throttling operation, to the change in the pressure is called the ***Joule-Thomson coefficient, μ.*** For the Joule-Thomson throttling operation which relationship is not true:

a. $P_{in}>P_{out}$

b. $H_{in}=H_{out}$

c. Hin>Hout

d. Q=0.0

Q71 Time constant for liquid level system is

a. V/Q

b. mc/ h A

c. **AR**

d. None

Q72 Two tank connected in interacting way is the example of

a. First order system

b. **Second order system**

c. First order plus dead time

d. Third order system

Q73 Disadvantage of PID Controller

a. Offset in the response

b. Oscillation in the response

c. **Tuning is difficult**

d. All the above

Q74 Routh array test is used for

a. stability of the system

b. Draw the root locus

c. Tuning the controllers

d. All the above

Q75 Overshoot is defined as

a. Double of Decay Ratio

b. Square of decay ratio

c. **Square root of Decay Ratio**

d. None

Q76 Open loop transfer function is

a. same as closed loop transfer function

b. Inverse of closed loop transfer function
c. One plus closed loop transfer function
d. **None**

Q77 Minus sign in Fourier's law of heat conduction is due to

a. **Temperature gradient**
b. decrease in thermal conductivity with increase in temperature
c. direction of area vector opposite to heat transfer
d. None of these

Q78 Convective heat transfer coefficient

a. Decreases with increase in Reynolds number
b. **increases with prandtl number**
c. increase with heat transfer area of heat exchanger
d. (All of the above

Q79 Tea kept in cup is cooled mainly due to Major part of heat removal by

a. Convection
b. Conduction
c. Radiation
d. equally by (a), (b) and (c)

Q80 Fouling in heat exchanger causes

a. Increase in resistance to convective heat transfer
b. increase in resistance to conduction
c. decrease in resistance to conduction
d. All of the above

Q81 Steam economy is related to

a. Shell and tube heat transfer coefficient
b. Natural condenser
c. Evaporator
d. boiler

Q82 Which law is not related to heat transfer

a. Newtons law of cooling

b. wein's law

c. kirchoff's law

d. Kick's law

Q83 According to film theory, mass transfer coefficient varies with mass diffusivity as

a. $D^{0.5}$

b. D

c. 1/D

d. $D^{1.5}$

Q84 Mass transfer for turbulent flow inside pipes, the Sherwood number depends upon the Reynolds number (Re) as

a. Re

b. $Re^{0.33}$

c. $Re^{0.5}$

d. $Re^{0.83}$

Q85 The solute A is being transferred from gas phase to a liquid phase in a column. The equilibrium relation is $y_A = 0.75x_A$. where y_A and x_A are mole fractions of A in gas phase and liquid phase, respectively. At one point in the column, the gas contains 10 mol% A and liquid 1.0 mol% A. Gas film mass transfer coefficient k_y at this point is 10 kmol/(hr. m^2. Δy_A) and 60% of the overall gas phase resistance. The mass flux in kmol/(hr. m^2) is

a. 0.51

b. 0.3

c. 0.15

d. 0.08

Q86 In distillation under total reflux conditions, number of theoretical stages would be

a. One

b. minimum

c. Infinite

d. None of these

Q87 A stream of waste gas containing 0.6 vol% ammonia in air is to be cleaned by removing 99.5% of the ammonia before it can be discharged in the atmosphere. Removal of ammonia is to be done in packed tower. Dilute sulphuric acid is used as solvent. Absorbed ammonia reacts instantaneously to form ammonium sulphate in solution. The number of transfer units based on gas phase is

a. 4.6

b. 5.3

c. 9.2

d. 10

Q88 The number of stages will be equal to the ratio of the total concentration change over the column to the concentration change over a single stage, when the absorption factor (A) is

a. A=1.0

b. A =10

c. A = 0.1

d. None

Q89 At 95°C the vapour pressure of benzene and toluene are 156 kPa and 63 kPa, respectively. The vapor and liquid phase compositions of benzene in equilibrium for benzene-toluene mixture at 101 kPa and 95°C are

a. 0.3,0.7

b. 0.41, 0.63

c. 0.63,0.41

d. 0.7,0.3

Q90 Very pure hydrogen (99.9%) can be made by which of the following processes?

a. Coal gasification

b. **Electrolysis**

c. Steam reforming

d. Partial oxidation of hydrocarbons

Q91 hat is the catalyst used in contact process in the conversion of Sulphur dioxide to Sulphur trioxide?

a. Molybdenum

b. Finely divided iron

c. Platinum

d. **Vanadium pentoxide**

Q92 LPG used for household cooking mainly comprises of-

a. propane and butane

b. propane and ethane

c. methane and ethane

d. methane and propane

Q93 Bleaching of paper pulp is done is done with

a. Activated clay

b. bromine

c. chlorine or chlorine dioxide

d. magnesium sulphide

Q94 During the process of making sugar from sugarcane, what is added to cane sugar juice to regulate the PH level?

a. **Lime solution**

b. Vinegar

c. Khand

d. none of these

Q95 If a liquid enters a pipe of diameter d with a velocity v, what will it's velocity at the exit if the diameter reduces to 0.5d?

a. v

b. 0.5 v

c. 2v

d. 4v

Q96 Calculate the mean hydraulic radius for a channel having $20m^2$ cross sectional area and 50m of wetted perimeter.

a. 0.4m

b. 0.5m

c. 6m

d. 0.7m

Q97 Water hammer in a pipeline result from the

a. bursting of pipelines due to closure of valves

b. rapid pressure changes due to a rapid change in the rate of flow

c. pressure increase due to closure of a valve resulting in decrease in rate of flow

d. none of these

Q98 The formation of vapour cavities is called _____

a. Static pressure drop

b. Cavitation

c. Isentropic expansion

d. Emulsion

Q99 If fluid is at rest in a container of a narrow mouth at a certain column height and same fluid is at rest at same column height in a container having broad mouth, will the pressure be different at certain depth from fluid surface.

a. Pressure will be same for both.

b. Pressure will be more for narrower mouth

c. Pressure will be less for narrower mouth

d. None of the mentioned

Q100 How do we calculate losses for a larger range of Reynolds number?

a. **Moody chart**

b. Bar Chart

c. Scatter Chart

d. Column histogram

.

Correct Option is marked in bold

Q1 `"By heaven methinks it were an easy leap

To pluck bright honour from the pale-fac'd moon,

Or dive into the bottom of the deep,

Where fathom line could never touch the ground,"

Expressions like "To pluck bright honour from the pale-fac'd moon" and "dive into the bottom of the deep" exemplify

a. Irony

b. Hyperbole

c. Hypotaxis

d. Personification

Q2 "The wolf with its belly stitched full of big pebbles;

Nibelung wolves barbed like black pine forest…"

In the above two lines, "Nibelung wolves barbed like black pine forest" exemplify

a. Simile

b. Metaphor

c. Metaphysical conceit

d. Irony

Q3 'hearing the smell' is an example of

a. Paradox

b. Oxymoron

c. Synaesthesia

d. Synaeresis

Q4 "The heart's flower withers at the root

Bury it, then, in history's sterile dust."

In the above lines, "The heart's flower" is an example of

a. Simile

b. Personification

c. Metaphor

d. Metonymy

Q5 "They rowed her in across the rolling foam –

The cruel, crawling foam"

is an example of

a. Pathos
b. Pathetic fallacy
c. Pattern
d. Alliteration

Q6 Identify the meter in the following line

I saw the spiders marching through the air

a. Pentameter
b. Hexameter
c. Tetrameter
d. Hexameter

Q7 Horace was a

a. Greek critic
b. German critic
c. Roman critic
d. French critic

Q8 Who said that 'art is twice removed from reality'?

a. Longinus
b. Plato
c. Aristotle
d. Horace

Q9 The term 'Hamartia' means

a. Conflict between protagonist and fate
b. A weakness in the protagonist
c. Change of fortune
d. Tragic ending

Q10 The term Anagnorisis means

a. Tragic flaw
b. Reversal of fate
c. Tragic fall
d. Recognizing the tragic flaw

Q11 Who was the first philosopher to give the theory of imitation?

a. Plato

b. Aristotle

c. Longinus

d. Horace

Q12 *Pi Patel: "So, you didn't like my story?"*

Mr. Okamoto: "No, we liked it very much. Didn't we, Atsuro? We will remember it for a long, long time."

Mr. Chiba: "We will."

(Silence)

Mr. Okamoto: "But for the purposes of our investigation, we would like to know what really happened."

"What really happened?"

"Yes."

"So you want another story?"

The above dialogue from a novel is an example of

a. Unreliable narrator

b. Reliable narrator

c. Objective narration

d. None

Q13 'Where I want to start telling is the day I left Pencey Prep. Pencey Prep is this school that's in Agerstown, Pennsylvania. You probably heard of it. You've probably seen the ads, anyway. They advertise in about a thousand magazines, always showing some hotshot guy on a horse jumping over a fence.'

The above paragraph exemplifies

a. First person narration

b. Objective narration

c. Third person narration

d. None of the above

Q14 G.M. Hopkins is known for his

a. Iambic meter

b. Similes

c. **Sprung rhythm**

d. Assonance

Q15 Pairs like slip-slop, creak-croak are examples of

a. Alliteration

b. **Consonance**

c. Assonance

d. Rhyme

Q16 "Careless she is with artful care,
Affecting to seem unaffected"
What do the above lines exemplify?

a. Paradox

b. Oxymoron

c. Irony

d. Satire

Q17 George Orwell's *Animal Farm* is an example of

a. Children's literature

b. **Allegory**

c. Comedy

d. Tragedy

Q18 Repression and the Unconscious are two important concepts in

a. **Freudian Psychoanalysis**

b. Lacanian Psychoanalysis

c. Jungian Theory

d. Deconstruction

Q19 Emile Zola is a name associated with

a. **Naturalism**

b. Realism

c. Symbolism

d. Expressionism

Q20 *Critique of Judgment* was written by

a. Descartes

b. Locke

c. **Kant**

d. Hegel

Q21 "Beauty is the form of the purposiveness of an object, so far as this is perceived without any representation of a purpose."

Who would you associate the above statement with?

a. Kant

b. Locke

c. Burke

d. Keats

Q22 "The nature of literature is influenced by the social and political circumstances in which it is produced."

The statement sums up the tenet of

a. Marxist literary theory

b. Feminism

c. Post-colonialism

d. Post-modernism

Q23 The term defamliarization is associated with

a. **New Criticism**

b. Russian Formalism

c. Structuralism

d. Post-structuralism

Q24 Who said that language "is made up solely of relations and differences with respect to the other terms of language."

a. Saussure

b. **Jakobson**

c. Derrida

d. Althusser

Q25 What is not correct about the Anglo-Saxon period?

a. It is also called the old English period

b. **It is supposed to cover the period between 1050-1350 AD**

c. *Beowulf* is the greatest literary representation of this age.

d. This epic also tells the story of Grendel

Q26 Which literary criticism does denote the analysis of "mythical narrative patterns, character types, themes, and motifs in literature…"?

The statement refers to

a. Psychoanalysis

b. Archetypal Criticism

c. Mythopoeic

d. Narratology

Q27 Reader-Response Theory is associated with

a. T. S. Eliot

b. Michel Foucault

c. Jacques Lacan

d. **Stanley Fish**

Q28 Who coined the term Objective Correlative?

a. Washington Allston

b. T. S. Eliot

c. John Keats

d. Matthew Arnold

Q29 Who said that the unconscious is structured like language?

a. Saussure

b. Freud

c. Lacan

d. Jung

Q30 Ideology is the key term for

a. **Althusser**

b. Cixous

c. Stanley Fish

d. Lacan

Q31 *Of Grammatology* is a famous work by Derrida. Who wrote *Writing and Difference*?

a. Roland Barthes

b. Jacques Derrida

c. Jacques Lacan

d. Edmund Husserl

Q32 Terms *Fabula* and *Sjuzhet* are associated with

a. New Criticism

b. Marxist Criticism

c. Feminism

d. **Narratology**

Q33 Which theoretical concept can be associated with having the following four characteristics:

Historical context, theoretical method, political commitment and textual analysis

a. Historical Materialism

b. Historical Criticism

c. Hagiographical account

d. Feminism

Q34 Who coined the term 'cultural materialism'?

a. Stanley Fish

b. Raymond Williams

c. Althusser

d. Lyotard

Q35 The narrow vision of class equates "nationalization" with "transfer into native hands of those unfair advantages which are a legacy of the colonial period."

The above statement is associated with

a. Bhagat Singh

b. Franz Fanon

c. Mahatma Gandhi

d. Edward Said

Q36 The famous work titled *Orientalism* is written by

a. Franz Fanon

b. Edward Said

c. Gayatri C. Spivak

d. Homi Bhabha

Q37 Who is the editor of *The Green Studies Reader: from Romanticism to Ecocriticism*?

a. Lawerence Olivier

b. Laurence Coupe

c. Harold Fromm

d. Richard Kerridge

Q38 Which term is associated with "the specificity of women's experiences and women's writing"?

a. Gynocriticism

b. Marxist-feminism

c. Deconstruction

d. Marxism

Q39 Who characterized herself as "female intellectual"?

a. Gayatri C. Spivak

b. Michèle Barret

c. Julia Kristeva

d. Hélène Cixous

Q40 The term 'alienation effect' is related to

a. Allen Tate

b. Cleanth Brooks

c. Walter Benjamin

d. Bertolt Brecht

Q41 The famous quote - "It isn't language which has a hole in its ozone layer." – is associated with

a. Ecocriticism

b. Structuralism

c. Post-structuralism

d. Postmodernism

Q42 Who wrote the famous essay, 'Introduction to the Structural Analysis of Narrative'?

a. Gerard Genette

b. Gerald Prince

c. Roland Barthes

d. Todorov

Q43 The term 'logocentricity' was coined by Ludwig Klages, which later on becomes an important point of engagement with Derrida. What does the term originally mean?

a. A view that all forms of thought are based on an external point of reference, which gives it a degree of authority

b. Logos is equal to God, who is present everywhere

c. Language has no meaning in itself

d. Meaning in language is context specific

Q44 The concept of 'the Real' is theorized by

a. Jacques Derrida

b. Roland Barthes

c. Jacques Lacan

d. Edward Said

Q45 Who said that postmodernism is the cultural logic of late capitalism?

a. Althusser
b. Lyotard
c. Walter Benjamin
d. Fredric Jameson

Q46 The concept of culture industry can be best defined in simple terms as

a. The culture of industry
b. The culture of industrialization
c. Popular culture works like an industry
d. Industrialization is the foundation of human culture

Q47 In which theory sexualities are understood in terms of fluidity?

a. Feminism
b. Queer Theory
c. Marxist-feminism
d. Post-colonial Theory

Q48 Who is the author of *Gender Trouble: Feminism and the Subversion of Identity*?

a. Judith Butler
b. Michel Foucault
c. Sigmund Freud
d. Julia Kristeva

Q49 The term polyphony means

a. Presence of many narrators
b. Presence of many voices in a text
c. More than one author of a text
d. None

Q50 How does Lyotard define postmodernism?

a. In terms of mass culture
b. As a cultural logic of late capitalism
c. As the end of grand narrative
d. As emergence of popular culture

PART- B

Q51 Which of the following is a work by William Shakespeare?

a. Troilus and Criseyde
b. The Shepherd's Calendar
c. Venus and Adonis
d. Steps to the Temple

Q52 To which period of Chaucer does *Troilus and Criseyde* belong?

a. First Period
b. Second Period
c. Third Period
d. Fourth Period

Q53 "The prince of darkness is a gentleman."
The above quote is from

a. King Lear
b. Hamlet
c. Macbeth
d. Othello

Q54 "Speak low, if you speak of love."
The above quote is from

a. Romeo and Juliet
b. Othello
c. Much Ado About Nothing
d. The Merchant of Venice

Q55 *The Vicar of Wakefield* written by Goldsmith is a

a. Novel
b. Drama
c. Poem
d. Criticism

Q56 Charles Dickens belongs to the

a. Romantic Period
b. Victorian Period

c. Modernism

d. Postmodernism

Q57 *A Room of One's Own* is a novel by

a. E. M. Forster

b. James Joyce

c. William Golding

d. Virginia Woolf

Q58 Which of the following is a novel by E. M. Forster?

a. A Room with a View

b. Darkness Visible

c. Heart of Darkness

d. Brave New World

Q59 When was *The Waste Land* published?

a. 1920

b. 1921

c. 1922

d. 1923

Q60 Which play by Lorraine Hansberry was the first play by an African-American to be staged at Broadway?

a. A Raisin in the Sun

b. The Drinking Gourd

c. The Arrival of Mr. Togod

d. None

Q61 In which famous novel does the character, Sethe, appear?

a. The Mill on the Floss

b. Farewell to Arms

c. Beloved

d. The Bostonians

Q62 Which American poet is known for his realistic depiction of rural life and using colloquial speech?

a. Robert Frost

b. Emily Dickinson

c. E. E. Cummings

d. Sylvia Plath

Q63 Who wrote the Pulitzer Award winning play, *No Place to be Somebody*?

a. Toni Morrison

b. Charles Gordone

c. Maya Angelou

d. Toni Cade

Q64 I Know Why the Caged Bird Sings is by

a. Maya Angelou

b. Toni Morrison

c. Michael Cliff

d. James Baldwin

Q65 Harlem Renaissance is known as blossoming of African American culture. What was the period of Harlem Renaissance?

a. 1890-1910

b. 1918-1937

c. 1850-1867

d. 2010-2018

Q66 Where is *The Scarlet Letter* by Nathaniel Hawthorne set?

a. England

b. New England

c. A village in Canada

d. Wessex

Q67 Samuel Langhorne Clemens is known by his pen name. What is his pen name?

a. Tom Sawyer

b. Mark Twain

c. Henry James

d. William Faulkner

Q68 Earnest Hemingway's *A Farewell to Arms* is set against the backdrop of World War- I. The novelist has consciously borrowed the title of the novel from a poet. What is the name of the poet?

a. John Donne

b. Philip Sidney

c. George Peele

d. George Herbert

Q69 The title of *The Sound and the Fury* is borrowed from

a. William Shakespeare's *Hamlet*

b. William Shakespeare's *Macbeth*

c. Christopher Marlowe's *Doctor Faustus*

d. Edward Albee's *The American Dream*

Q70 Which play by Arthur was based on witchcraft trials in Salem in 1692?

a. The Crucible

b. All My Sons

c. After the Fall

d. Death of a Salesman

Q71 The term *mise-en-scène* means

a. Mystery of a scene

b. What is put into the scene

c. Editing of a scene

d. None

Q72 What would you Sergei Eisenstein associate with?

a. Montage

b. Mise-en-scène

c. Costume

d. Lighting

Q73 Auteur Theory in film studies is linked with

a. Cinematic apparatus

b. Authorship

c. Screenwriter

d. Art direction

Q74 Who is the director of *The Bicycle Thieves*?

a. Alfred Hitchcock

b. Francis Ford Coppola

c. Vittorio de Sicca

d. Jean-Luc Godard

Q75 Who discusses adaptation as a ‘product’ and as a ‘process’?

a. Robert Stam
b. George Bluestone
c. Julie Sanders
d. Linda Hutcheon

Q76 Satyajit Ray’s famous film, *Pather Panchali*, is an adaptation of a novel written by

a. Bibhutibhushan Bandopadhyay
b. Premchand
c. Sarat Chandra Chattopadhyay
d. Bankim Chandra Chatterjee

Q77 *Train to Pakistan* is a famous novel by Khushwant Singh. Who adapted the novel into a film?

a. Shyam Benegal
b. Pamela Rooks
c. Govind Nihalani
d. Gulzar

Q78 *Junoon* is a famous film made by Shyam Benegal. The film is an adaptation of a novella written by

a. Ruskin Bond
b. Amitav Ghosh
c. Kamala Deshpande
d. Anita Desai

Q79 *Heat and Dust* is directed by James Ivory. Who wrote the screenplay of the film?

a. Ismail Merchant
b. Ruth Prawer Jhabvala
c. James Ivory
d. Alfred Hitchcock

Q80 Vishal Bhardwaj has adapted Shakespeare’s tragedies in Indian context. Find the correct answer.

a. Omkara: Hamlet
b. Haider: King Lear
c. Maqbool: Macbeth
d. Haider: Othello

Q81 A mythological creature who was lion in her fore-third, goat in her middle-third and serpentine her hind-third is known as

a. Chimaera

b. Charybdis

c. Medusa

d. Nemesis

Q82 "What will Mrs Grundy say?"

In the above line, Mrs Grundy epitomizes the rigid, Puritanical-minded person or the proper-thinking neighbour who we all are conscious of. What is the source of the above statement?

a. Thomas Morton's *Speed the Plough*

b. Eugene O'Neill's Desire Under the Elms

c. Arthur Miller's *All My Sons*

d. G. B. Shaw's *Arms and the Man*

Q83 Apollo is the god of

a. Love

b. Beauty

c. Sun

d. Moon

Q84 'Leda and the Swan' is a poem by W. B. Yeats. Who is the Swan in the poem?

a. Apollo

b. Zeus

c. Loki

d. Theseus

Q85 Abdulrazak Gurnah has won the Nobel Prize for Literature. Where was he born?

a. England

b. Kenya

c. Tanzania

d. South Africa

Q86 *Love in the Time* of Cholera is a novel by

a. Edith Grossman

b. Gabriel Garcia Marquez

c. Mario Vargas Llosa

d. Isabel Allende

Q87 *The House of Bernarda Alba* is a famous play by Lorca. Who wrote *Blood Wedding*?

a. Lorca

b. Llosa

c. Alvajar

d. Rubio

Q88 *The Lion and the Jewel* is a play written by

a. Harold Pinter

b. Wole Soyinka

c. Bertolt Brecht

d. Tennessee Williams

Q89 *Waiting for Godot* by Samuel Beckett belongs to the category of

a. Realist Drama

b. Kitchen Sink Drama

c. Theatre of the Absurd

d. Experimental Drama

Q90 Which set of themes define Franz Kafka as a novelist?

a. Realism and Naturalism

b. Life and Comedy

c. Nature and Man

d. Existentialism and Absurdity

Q91 A Very Indian Poem by Nissim Ezekiel is a

a. Satirical poem

b. Romantic poem

c. Nationalist poem

d. Tragic poem

Q92 The poem “History” is written by

a. Toru Dutt

b. A. K. Ramanujan

c. Sarojini Naidu

d. Rabindranath Tagore

Q93 Which of the following novels is not set in Delhi?

a. Twilight in Delhi
b. Clear Light of Day
c. Delhi: A Novel
d. Samskara

Q94 Ibis trilogy by Amitav Ghosh comprises of

a. The Circle of Reason, The Shadow Lines and The Glass Palace
b. Sea of Poppies, River of Smoke, Flood of Fire
c. The Hungry Tide, Sea of Poppies, Flood of Fire
d. The Calcutta Chromosome, The Circle of Reason, The Shadow Lines

Q95 What is the correct title of the play by Mahesh Dattani.

a. The Final Solution
b. Final Solution
c. Final Solutions
d. A Final Solution

Q96 The play Tughlaq is written by

a. Rabindranath Tagore
b. Girish Karnad
c. Vijay Tendulkar
d. Badal Sircar

Q97 Salman Rushdie is a famous and prolific writer. Which of the following books is not written by him?

a. Midnight's Children
b. Joseph Anton
c. Shame
d. The Thousand Faces of Night

Q98 *A Suitable Boy* is an adaptation of a novel. Who has written the novel?

a. Vikram Seth
b. Salman Rushdie
c. Khushwant Singh
d. Amitav Ghosh

Q99 In which novel do we find the character of Bakha?

a. The Guide
b. The Serpent and the Rope
c. Untouchable
d. The White Tiger

Q100 *A House for Mr Biswas* is written by

a. Neel Mukherjee
b. Vikram Seth
c. V. S. Naipaul
d. Meena Alexander

Correct Option is marked in bold

Q1 What is the formula for calculating the sample standard deviation?

a. $\sqrt{(\Sigma(x-\mu)^2/n)}$

b. $\sqrt{(\Sigma(x-\mu)^2/n-1)}$

c. $\Sigma(x-\mu)/n$

d. $\Sigma(x-\mu)/n-1$

Q2 What is the range of a data set?

a. The difference between the highest and lowest values in the data set

b. The average of the data set

c. The median of the data set

d. The standard deviation of the data set

Q3 What is the correlation coefficient between two variables if the value is -1?

a. Perfect positive correlation

b. Strong positive correlation

c. No correlation

d. Perfect negative correlation

Q4 What is the z-score of a data point that is one standard deviation above the mean?

a. 0

b. 1

c. 2

d. 3

Q5 The only solution of the system of linear equations

$2x + y + 3z = 13$

$x + y + z = 6$

$3x + y + z = 8$

is

a. x=2, y=3, z=1

b. x=1, y=2, z=3

c. x=2, y=1, z=1

d. x=3, y=1, z=2

Q6 The value of the parameter 'a' for which the system of linear equations

$(a+1)x + 8y = 4a$

$ax + (a+3)y = 3a-1$

has infinite number of solutions is

a. 0

b. 1

c. -1

d. 5

Q7 What is the order of the differential equation y" + 2y' + y = 0?

a. 1

b. 2

c. 3

d. 4

Q8 $\lim_{x\to 0} \frac{xe^{\frac{1}{x}}}{1+e^{\frac{1}{x}}}$ equals

a. 0

b. 1

c. ∞

d. $-\infty$

Q9 What is a homogeneous differential equation?

a. A differential equation where all terms are of the same degree

b. A differential equation where all terms are of the same variable

c. A differential equation where all terms are constant

d. A differential equation where all terms involve the dependent variable and its derivatives

Q10 The weighted average mean of the first n natural numbers, the weight being equal to the corresponding numbers, is

a. $\frac{2n+1}{3}$

b. $\frac{(n+1)\,(2n+1)}{6}$

c. $\frac{n\,(n+1)}{6}$

d. $\frac{2n+1}{6}$

Q11 A student obtained mean= 40 of 100 observations. It was discovered later that he had wrongly copied down one observation as 50 instead of 40. The correct mean is.

a. 35.9

b. 39.9

c. 37.9

d. 38.9

Q12 Which of the following is a linear differential equation?

a. y' = 2xy

b. y' = y^2

c. y' = 2x + y

d. y' = sin(x)cos(y)

Q13 What is the derivative of $f(x) = e^x + \log(x)$?

a. $e^x + 1/x$

b. $e^x - 1/x$

c. $e^x + \log(x)$

d. $e^x - \log(x)$

Q14 What is the limit of $f(x) = (x^2 - 4)/ (x - 2)$ as x approaches 2?

a. 0

b. 1

c. 2

d. undefined

Q15 The integral of f(x) = sin(x) is:

a. -cos(x) + C

b. cos(x) + C

c. -sin(x) + C

d. sin(x) + C

Q16 What is the limit of $f(x) = (x^2 + x + 1)/ (x^2 - x + 1)$ as x approaches infinity?

a. 1

b. -1

c. infinity

d. undefined

Q17 The integral of $f(x) = 1/(x+1)$ is:

a. log(x+1) + C

b. $e^{(x+1)} + C$

c. $1/\log(x+1) + C$

d. $-1/(x+1) + C$

Q18 What is the limit of $f(x) = (x-1)/(x+1)$ as x approaches 1?

a. -1

b. 0

c. 1

d. undefined

Q19 What is the derivative of the function $f(x) = 1/x^2$?

a. $-2/x^3$

b. $2/x^3$

c. $-1/x$

d. $1/x$

Q20 Which of the following is the Chain Rule?

a. The derivative of a constant function is 0

b. The derivative of the sum of two functions is the sum of their derivatives

c. The derivative of a product of two functions is the product of their derivatives

d. The derivative of a composite function is the product of the derivatives of its components

Q21 Which of the following is the definition of a derivative?

a. The limit of the average rate of change as the time interval approaches 0

b. The limit of the slope of the tangent line as the time interval approaches 0

c. The limit of the area under the curve as the time interval approaches 0

d. The limit of the product of two functions as the time interval approaches 0

Q22 What is the derivative of a constant function?

a. 0

b. 1

c. -1

d. The derivative does not exist

Q23 Which of the following is not a matrix factorization technique?

a. QR Decomposition

b. Singular Value Decomposition (SVD)

c. Eigenvalue Decomposition

d. Gaussian Elimination

Q24 Which of the following is true about an orthogonal matrix?

a. Its inverse is equal to its transpose

b. Its determinant is always 1

c. Its columns are always orthogonal to each other

d. All of the above

Q25 Which of the following is not a way to obtain a reduced row echelon form matrix?

a. Gauss-Jordan Elimination

b. Backward Substitution

c. Forward Substitution

d. Elementary Row Operations

Q26 Which of the following is not a property of an invertible matrix?

a. Its determinant is not equal to 0

b. Its columns are linearly independent

c. Its rows are linearly independent

d. Its null space is empty

Q27 Which of the following is true about the null space of a matrix?

a. It contains only the zero vector

b. It is the set of all solutions to the equation Ax = 0

c. It is the set of all solutions to the equation Ax = b

d. None of the above

Q28 Which of the following matrix operations is not commutative?

a. Addition

b. Multiplication

c. Inverse

d. Transpose

Q29 What is the determinant of an identity matrix?

a. 0

b. 1

c. -1

d. It varies depending on the size of the matrix

Q30 What is an eigenvalue of a matrix?

a. A vector that remains unchanged in direction after being multiplied by the matrix

b. A vector that changes in direction after being multiplied by the matrix

c. A scalar value that, when multiplied by an eigenvector, results in the same vector multiplied by the matrix

d. A scalar value that, when added to the diagonal of the matrix, results in a diagonal matrix

Q31 What is the rank of a matrix?

a. The number of columns in the matrix

b. The number of rows in the matrix

c. The maximum number of linearly independent rows or columns in the matrix

d. The minimum number of linearly independent rows or columns in the matrix

Q32 What is the determinant of a 3×3 matrix [a b c; d e f; g h i]?

a. aei + bfg + cdh - ceg - bdi - afh

b. aei + bfg - cdh - ceg - bdi - afh

c. aei + bfg + cdh + ceg + bdi + afh

d. aei - bfg - cdh - ceg - bdi + afh

Q33 What is an eigenvector of a matrix?

a. A vector that remains unchanged in direction after being multiplied by the matrix

b. A vector that changes in direction after being multiplied by the matrix

c. A vector that has a scalar multiple equals to its original value after being multiplied by the matrix

d. A vector representing the matrix

Q34 Let S be a set of n elements. The number of ordered pairs in the largest and smallest equivalence relations on S are:

a. N and n

b. n^2 and n

c. n and o

d. n and 1

Q35 $\int dx/(\sin x + Cosx)$ is equal to

a. $1/\sqrt{2}(\log(\tan(\frac{x}{4}+\frac{\pi}{4})$

b. $\mathbf{1/\sqrt{2}(\log(\tan(\frac{x}{2}+\frac{\pi}{8})}$

c. $1/\sqrt{2}(\log(\tan(\frac{x}{2}+\frac{\pi}{6})$

d. $1/\sqrt{2}(\log(\tan(\frac{x}{1}+\frac{\pi}{4})$

Q36 Which of the following is not necessarily a property of a group?

a. Commutatively

b. Existence of identity

c. Associativity

d. Existence of inverse of every element

Q37 The generating function for the sequence 0,1,2,4,8,…..is

a. Z/ (1+2Z)

b. $2Z/ (1+Z^2)$

c. (1+3Z)/ (1+8Z)

d. $(Z^2 + 1)/ (Z^2 - 1)$

Q38 How many ways are there to arrange the nine letters in the string ABBACDAEA?

a. 7560

b. 15120

c. 7500

d. 1580

Q39 What is the derivative of ln(x) with respect to x?

a. 1/x

b. x

c. log(x)

d. 0

Q40 What is the slope of the line passing through the points (2, 3) and (4, 7)?

a. 1

b. 2

c. 3

d. 4

Q41 What is the value of the Maclaurin series expansion of cos(x)?

a. cos(x)

b. sin(x)

c. $1 - x^2/2! + x^4/4! - ...$

d. e^x

Q42 What is the Laplace transform of a constant function?

a. Constant × 1/s

b. Constant × s

c. ∞

d. 0

Q43 What is the value of ∫ sin(x) dx?

a. cos(x) + C

b. -cos(x) + C

c. sin(x) + C

d. -sin(x) + C

Q44 What is the value of the definite integral from 0 to π/2 of sin(x) dx?

a. 0

b. 1

c. 2

d. Undefined

Q45 What is the value of log(e)?

a. 0

b. 1

c. e

d. Undefined

Q46 What are the eigen values of the following 2×2 matrix $\begin{bmatrix} 2 & -1 \\ -4 & 5 \end{bmatrix}$

a. -4 and -1

b. 1 and 6

c. 2 and 5

d. 1 and -1

Q47 Consider the following determinant:

$$A = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$$

Which of the following is a factor of A?

a. a+b+c

b. abc

c. a+b

d. a-b

Q48 Two coins are simultaneously tossed. The probability of two heads simultaneously appearing

a. ½

b. ¼

c. 2

d. 1/8

Q49 $\text{Lim}_{x \to 0} \frac{Sin^2 x}{x}$ is equal to

a. 0

b. 1

c. -1

d. ∞

Q50 What is the expected value of rolling a fair six-sided die?

a. 1

b. 2

c. 3.5

d. 6

Q51 Which of the following grinding processes is used for high production run?

a. Cylindrical grinding

b. Surface grinding

c. **Centerless grinding**

d. Internal grinding

Q52 Which of the following is a measure of the maximum permissible deviation from the basic size of a part?

a. **Tolerance**

b. Fit

c. Limit

d. Clearance

Q53 Jigs and fixtures can be constructed through:

a. casting

b. fabrication

c. welding

d. **all of the above**

Q54 Which of the following is not used as the tool electrode in EDG?

a. Copper wire

b. Tungsten carbide

c. Diamond

d. **All of the above**

Q55 Which of the following is a component of MIS?

a. Inquiry processing
b. Data entry
c. External database
d. Knowledge engine

Q56 In CNC, G-codes are known as:

a. preparatory codes
b. spindle speed codes
c. tool selection codes
d. miscellaneous codes

Q57 The highest level of automation is found in

a. CNC machine tools
b. Automatic transfer machines
c. DNC machining centre
d. Machine tool with electrohydraulic positioning and control

Q58 What is the purpose of ABC analysis in inventory control?

a. **To classify items based on their demand rate and value**
b. To calculate the optimal order quantity for each item
c. To determine the safety stock level for each item
d. To identify the lead time for each item

Q59 Simplex problem is considered as infeasible when:

a. all the variables in entering column are negative
b. variables in the basis are negative
c. artificial variables are present in basis
d. pivotal value is negative

Q60 _____ produces the highest heat flux?

a. Gas tungsten arc welding
b. Gas metal arc welding
c. Submerged arc welding
d. **Laser beam welding**

Q61 The process of increasing carbon percentage on the surface of low-carbon steel is known as:

a. hardening
b. nitriding
c. carburizing
d. tempering

Q62 Which of the following casting defects is caused by a lack of molten material in the mold?

a. Shrinkage porosity
b. **Cold shuts**
c. Hot tears
d. Gas porosity

Q63 Which of the following casting methods is suitable for high volume production?

a. Sand casting
b. Investment casting
c. **Die casting**
d. Centrifugal casting

Q64 What is the relationship between the Carnot cycle and the second law of thermodynamics?

a. The Carnot cycle violates the second law of thermodynamics.
b. **The Carnot cycle is the most efficient cycle that is consistent with the second law of thermodynamics.**
c. The Carnot cycle is a cycle that does not violate the second law of thermodynamics, but is less efficient than other cycles.
d. The Carnot cycle is a cycle that is more efficient than any other cycle, regardless of the second law of thermodynamics.

Q65 What type of chips form while machining of brittle materials?

a. continuous chips
b. **discontinuous chips**
c. built-up chips
d. none of the above

Q66 Seam welding is a

a. **Multi spot welding process**
b. Continuous spot-welding process

c. Used to form mesh

d. Used for welding cylindrical objects

Q67 What is thermal conductivity?

a. The ability of a material to conduct electricity

b. **The ability of a material to conduct heat**

c. The ability of a material to resist deformation

d. The ability of a material to absorb radiation

Q68 What is the difference between a heat engine and a refrigerator?

a. **A heat engine converts heat into work, while a refrigerator converts work into heat.**

b. A heat engine operates in a cycle, while a refrigerator operates in a steady state.

c. A heat engine has a higher efficiency than a refrigerator.

d. A refrigerator has a higher efficiency than a heat engine

Q69 Temperature of a gas is produced due to

a. Its heating value

b. **Kinetic energy of molecules**

c. Repulsion of molecules

d. Attraction of molecules

Q70 Which of the following is not a common method for joining two components in a machine?

a. Welding

b. Bolting

c. Riveting

d. **Soldering**

Q71 What is the purpose of a key in a machine?

a. **To transmit power from one component to another**

b. To prevent two components from rotating relative to each other

c. To maintain alignment between two components

d. To reduce friction between two components

Q72 Resilience of a material is important, when it is subjected to

a. Combined loading
b. **Shock loading**
c. Thermal stresses
d. Wear and tear

Q73 Which of the following materials is most commonly used for gears?

a. Aluminum
b. Brass
c. **Steel**
d. Copper

Q74 What of the following statement is true for a bearing in a machine?

a. It transmits power from one component to another
b. **It reduces friction between two moving parts**
c. It aligns two components that is not perfectly aligned
d. It provides a smooth surface for a sliding component

Q75 _____ is not a common failure mode in mechanical components.

a. Fatigue failure
b. Creep failure
c. **Torsion failure**
d. Wear failure

Q76 Which of the following is true according to the Stefan-Boltzmann law?

a. **The amount of energy emitted by a blackbody is directly proportional to its temperature**
b. The amount of energy emitted by a blackbody is inversely proportional to its temperature
c. The amount of energy emitted by a blackbody is independent of its temperature
d. The amount of energy emitted by a blackbody is equal to its temperature

Q77 What is the NTU method used for in heat exchanger analysis?

a. Determining the overall heat transfer coefficient
b. Calculating the heat transfer rate
c. **Evaluating the effectiveness of the heat exchanger**
d. Determining the pressure drop in the heat exchanger

Q78 Fre convection heat flow depends on all of the followings except:

a. density
b. coefficient of viscosity
c. gravitational force
d. **velocity**

Q79 Which of the following is not true in respect to the following statement?
Heat flowing from one side to other side directly depends on _____.

a. Face area
b. Time
c. **Thickness**
d. Temperature difference

Q80 Which engine emits more amount of nitrogen oxide?

a. Spark Ignition engine
b. **Compressed Ignition engine**
c. 2-stroke engine
d. LPG engine

Q81 In ECM material removal is due to

a. Corrosion
b. Erosion
c. Fusion
d. **Ion displacement**

Q82. Which of the following forces is an example of a contact force?

a. Gravitational force
b. Magnetic force
c. **Normal force**
d. Electric force

Q83. Machinability of a metal depends on

a. Tensile strength
b. Toughness

c. Hardness

d. **Both a and b**

Q84. Which of the following statement is correct in reference to trusses?

a. One or more than one member is a two-force member.

b. The members are joined by temporary joints

c. They have some moving parts

d. **None of the above**

Q85. A beam is supported at both ends and has a weight of 500 N. If a force of 100 N is applied at the midpoint of the beam, what is the virtual work done by the force when the beam is displaced by 0.1 m in the direction of the force?

a. 0 J

b. **5 J**

c. 10 J

d. 50 J

Q 86. What is the equation for finding the center of Mohr's Circle?

a. $(\sigma_1 - \sigma_2) / 2, 0$

b. **$(\sigma_1 + \sigma_2) / 2, 0$**

c. $0, (\tau_{max} - \tau_{min}) / 2$

d. $0, (\tau_{max} + \tau_{min}) / 2$

Q87. _____ is a solid-state joining process

a. Gas tungsten arc welding

b. Resistance spot welding

c. Friction welding

d. Submerged arc welding

Q88. Two infinite parallel plates are placed at a certain distance apart. An infinite radiation shield is inserted between the plates without touching any of them to reduce heat exchange between the plates. Assume that the emissivities of plates and radiation shield are equal. The ratio of the net heat exchange between the plates with and without the shield is

a. **1/2**

b. 1/3

c. 1/4

d. 1/8

Q89. A 1 kg object moving at 8 m/s collides with a 2 kg object moving at 4 m/s in the opposite direction. After the collision, the 1 kg object moves at 4 m/s. What is the final velocity of the 2 kg object?

a. 0 m/s
b. 2 m/s
c. **4 m/s**
d. 6 m/s

Q90. In Whitworth mechanism, which component is responsible for the quick return motion?

a. the rotating crank
b. the slotted lever
c. the fixed frame
d. the connecting rod

Q91. Which of the following errors are regularly repetitive in nature?

a. Systematic errors
b. Random errors
c. Illegitimate errors
d. Controllable errors

Q92. _____ cannot be considered as part of a simple carburetor?

a. Idling system
b. Float chamber
c. Throttle valve
d. Nozzle with metering orifice

Q93. What is the critical speed of a governor?

a. The maximum speed at which the governor can operate safely
b. **The speed at which the governor becomes unstable and fails to regulate the speed of the engine**
c. The speed at which the governor generates the maximum centrifugal force
d. The minimum speed at which the governor can regulate the speed of the engine

Q94. _____ is typically used for multi-cylinder reciprocating engines?

a. Static balancing
b. **Dynamic balancing**
c. Counterbalancing
d. All of the above

Q95. Increasing the mass of a flywheel in a machine _____.

a. I**ncreases the energy storage capacity of the flywheel**
b. Decreases the energy storage capacity of the flywheel
c. Does no effect on the energy storage capacity of the flywheel
d. Increases the power output of the machine

Q96. What is the unit of viscosity?

a. kg/m^3
b. N/m
c. **Pa·s**
d. J/kg

Q97. Assuming no slip-condition of inner wall of a pipe in which the fully developed turbulent flow of a liquid occurs, which one of the following statements is ONLY correct about the conditions at the wall?

a. total shear stress is zero
b. friction factor is zero
c. Reynold stresses are non-zeros
d. **turbulent shear stress is zero**

Q98. For a hydraulic turbine operating at two different heads, the ratio of their speeds will be 3:1. For the two heads, the ratio of the shaft power developed by the turbine will be:

a. 9:1
b. 243:1
c. 3:1
d. **27:1**

Q99. The meta center of a floating body is:

a. The point at which the vertical line passing through the center of gravity intersects with the centerline of the body when it is tilted at a small angle

b. **The point at which the vertical line passing through the center of buoyancy intersects with the centerline of the body when it is tilted at a small angle**

c. The point at which the center of gravity intersects with the waterline

d. The point at which the center of buoyancy intersects with the waterline

Q100. Which one of the following laws is applicable to hydraulic lift?

a. Kirchoff's law

b. Pascal's law

c. Archimede's principle

d. None of the above

Correct Option is marked in bold

Q1 Which of the following is an example of applied research?

a. Studying the behavior of subatomic particles

b. Developing a new drug for diabetes

c. Understanding human evolution

d. Theoretical physics equations

Q2 Which of the following is probability sampling technique?

a. Snowball sampling

b. Quota sampling

c. Convenience technique

d. Simple random technique

Q3 What is the difference between reliability and validity?

a. Reliability refers to accuracy, and validity refers to consistency

b. Reliability refers to consistency, and validity refers to accuracy

c. Both are the same

d. Neither is important in research

Q4 Type-1 Error occurs when

a. The null hypothesis is rejected even when it is true

b. The null hypothesis is accepted even when it is false

c. The null hypothesis as well as Alternative hypothesis, both are rejected

d. None of the above

Q5 Which of the following is a non-probability sampling method?

a. System random sampling

b. Systematic sampling

c. Cluster sampling

d. **Quota sampling**

Q6 The coefficients a,b,c in the quadratic equation $ax^2 + \mathrm{bx} + \mathrm{c} = 0$ are from the set {1,2,3,4,5,6,7,8}. The probability of this equation having repeated roots is:

a. $\frac{3}{256}$

b. $\frac{1}{128}$

c. $\mathbf{\frac{1}{64}}$

d. $\frac{3}{64}$

Q7 A discrete random variable X has the probability distribution as:

x	0	1	2	3	4
f(x)	3/8	1/3	1/4	a	1/24

The value of Var(X) is:

a. 5

b. 1

c. 23

d. 2

Q8 If A, B, C are three mutually exclusive and exhaustive events such that P(B)=3/2 P(A), P(C)=1/2 P(B), then P(A) is?

a. 5/14

b. 5/13

c. 4/11

d. 4/13

Q9 Find the outliers in the given data set 15,11,9,15,63

a. -11

b. -9

c. -63

d. -15

Q10 Which of the following tool is used for estimating standard errors and the bias of estimators?

a. knitr

b. jackknife

c. ggplot2

d. all of the mentioned

Q11 Fit a straight-line y=a+bx into the given data: (x,y):(5,12)(10,13)(15,14)(20,15)(25,16).

a. y=11

b. y=0.2x

c. y=11+0.2x

d. y=1.1+0.2x

Q12 Look at this series: 7, 10, 8, 11, 9, 12, ... What number should come next?

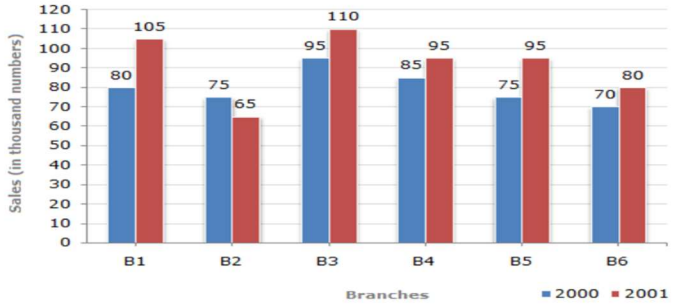
a. 7

b. 10

c. 12

d. 13

Q13 The bar graph given below shows the sales of books (in thousand number) from Six Branches - B1, B2, B3, B4, B5 and B6 of a publishing Company in 2000 and 2001.



What is the ratio of the total sales of branch B2 for both years to the total sales of branch B4 for both years?

a. 2:3

b. 3:5

c. 4:5

d. 7:9

Q14 Three times the first of three consecutive odd integers is 3 more than twice the third. The third integer is:

a. 9

b. 11

c. 13

d. 15

Q15 In a normal curve the ordinate is highest at

a. Mean

b. Variance

c. Standard deviation

d. None

Q16 The least perfect square, which is divisible by each of 21, 36 and 66 is:

a. 213444

b. 214344

c. 214434

d. 231444

Q17 A coffee shop blends 2 kinds of coffee, putting in 2 parts of a 33p. a gm. grade to 1 part of a 24p. a gm. If the mixture is changed to 1 part of the 33p. a gm. to 2 parts of the less expensive grade, how much will the shop save in blending 100 gms.

a. Rs. 90

b. Rs. 8

c. Rs. 3

d. Rs. 1

Q18 If for some $x \in R,$ the frequency distribution of the marks obtained by 20 students in a test is:

Marks	2	3	5	7
Frequency	$(x+1)^2$	$2x-5$	x^2-3x	x

Then the mean of the marks is

a. 3.0

b. 2.5

c. 2.8

d. 3.2

Q19 The average marks of boys in class is 52 and that of girls is 42. The aversge marks of boys and girls combined is 50. The percentage of boys in the class is

a. 80

b. 60

c. 40

d. 20

Q20 If the variance of the frequency distribution

x	c	2c	3c	4c	5c	6c
f	2	1	1	1	1	1

is 160, then the value of $c \in N$ is

a. 6

b. 8

c. 5

d. 7

Q21 Let the mean and variance of 6 observations $a, b, 68, 44, 48, 60$ be 55 and 194, respectively. If $a > b$, then $a + 3b$ is

a. 210

b. 190

c. 200

d. 180

Q22 A fair coin is tossed repeatedly unless a head is obtained. The probability that the coin has to be tossed at least four times is

a. 1/2

b. 1/4

c. 1/6

d. 1/8

Q23 When the alternative hypothesis is $\sigma > \sigma_0$, the test is

a. Two tailed

b. Right tailed

c. Left tailed

d. None of these

Q24 The mean deviation about the mean and the standard deviation of the set of numbers 3, 5, 6, 7, 10, 12, 15, 18are respectively:

a. 4.1, 4.5

b. 4.15, 4.825

c. 4.25, 4.875

d. 3.75, 2.575

Q25 We get standard normal distribution from normal distribution if

a. $\mu = 0, \sigma = 1$

b. $\mu = 1, \sigma = 0$

c. $\mu = \sigma = 0$

d. $\mu = \sigma = 1$

Q26 Which among the following are the measures of Central Tendency?

A. Mean B. Range C. Mode D. Median E. Variance

a. A, B, C and E only

b. C, D and E only

c. A, C and D only

d. B, C and D only

Q27 In which of the following practical situations can Poisson Distribution be used?

A. Number of customers arriving at the supermarkets per hour.

B. Number of typographical errors per page in a typed material.

C. Number of accidents taking place per day on a busy road.

D. Dice throwing problems

E. Number of defective material say, blades, etc. in packaging manufactured goods.

a. B, D, and E only

b. A, B, C and E only

c. A, C, D, and E only

d. A, B, C and D only

Q28 Which of the following is true for the coefficient of correlation?

a. The coefficient of correlation is dependent on the change of scale

b. The coefficient of correlation is dependent on the change of origin

c. The coefficient of correlation is not dependent on both the change of scale and change of origin

d. None of the above

Q29 The mean of a set of scores is 50 and standard deviation is 10. If the score of each student is doubled, the new median will be:

a. Remain unchanged

b. Increase by double

c. Decrease by half

d. Become equal to mean

Q30 A man has 12 friends whom he wants to invite for lunch. In how many ways can he invite at least 10 of them?

a. 66

b. 140

c. 153

d. 10

Q31 A man sitting beside me at a hotel ate idlis one after the other by ordering plate by plate. He said to me after drinking some water the last one I ate was my hundredth idli in last five days. Each day I ate 6 more than the previous day. How many he ate yesterday?

a. 26

b. 24

c. 22

d. 20

Q32 Find the missing sequence in the letter series below:

A, CD, GHI, ?, UVWXY

a. LMN

b. MNQ

c. MNOP

d. NOPQ

Q33 X is 1Km northwest of Y. Y is 1 Km southeast of Z. W is 1 Km west of Z. P is 1 Km south of W. Q is 1 Km east of P. What is the distance between X and Q in Km?

a. 1

b. $\sqrt{2}$

c. $\sqrt{3}$

d. 2

Q34 The smallest number which when increased by 3 is divisible by 27, 35, 25 and 21 is

a. 4722

b. 45698

c. 1254

d. 7896

Q35 Raju has 14 currency notes in his pocket consisting of only Rs. 20 notes and Rs 10 notes. The total money value of the notes is Rs.230. The number of Rs 10 notes that Raju has is

a. 5

b. 6

c. 10

d. 9

Q36 From a circular sheet of paper of radius 30 cm, a sector of 10% area is removed. If the remaining part is used to make a conical surface, then the ratio of the radius and height of the cone is

a. 2.58

b. 2.06

c. 1.95

d. 1.78

Q37 A car travels 8 Km in the first quarter of an hour, 6 km in the second quarter and 16 km in the third quarter. The average speed of the car in km per hour over the entire journey is

a. 30

b. 36

c. 40

d. 24

Q38 5 skilled workers can build a wall in 20 days, 8 semi-skilled workers can build a wall in 25 days, 10 unskilled workers can build a wall in 30 days. I f a team has 2 skilled workers, 6 semi-skilled and 5 unskilled workers, how long will it take to build the wall?

a. 20 days

b. 18 days

c. 16 days

d. 15 days

Q39 The percentage of alcohol in two wine tanks is 20 and 40 respectively and rest is grape juice. If a wine glass is filled to its half by the tank 1 and 2 in the ratio 2:3 and the rest is filled again by pure alcohol, then the ratio of the grape juice to alcohol in the wine glass is

a. 10:89

b. 17:33

c. 54:67

d. 20:51

Q40 A merchant has 1000kg of sugar, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The quantity sold at 18% profit is?

a. 500 kg

b. 400 kg

c. 600kg

d. 700kg

Q41 How many four-digit numbers can be formed with the 10 digits 0, 1, 2, …, 9 if no number can start from 0 and if the repetitions are not allowed?

a. 4598

b. 4536

c. 4597

d. 4587

Q42 Given set A= {2, 3, 4, 5} and set B= {11, 12, 13, 14, 15}, two numbers are randomly selected, one from each set. What is the probability that the sum of the two numbers equals 16?

a. **0.20**

b. 0.25

c. 0.30

d. 0.33

Q43 If the price of wheat be raised 30%, then by what % a household must reduce his consumption of the article so as not to increase his expenditure?

a. $\frac{\mathbf{300}}{\mathbf{13}}$

b. $\frac{45}{98}$

c. $\frac{11}{74}$

d. 15

Q44 A ball is dropped from a height of 12 m and it rebounds ½ of the distance it falls. If it continues to fall and rebound in this way, how far will it travel before coming to the rest?

a. 36 m

b. 30 m

c. 48 m

d. 60 m

Q45 If ROAD is written as URDG, then SWAN should be written as

a. VXDQ

b. VZDQ

c. VZDP

d. UXDQ

Q46 Ram and Ramesh appeared in an interview for two vacancies in the same department. The probability of Ram's selection is 1/6 and that of Ramesh is 1/8. What is the probability that only one of them will be selected?

a. $\frac{47}{48}$

b. $\mathbf{\frac{1}{4}}$

c. $\frac{13}{48}$

d. $\frac{35}{48}$

Q47 In a certain paired data n =18 and r= 0.44,

Null hypothesis H_0 $:\rho = 0.30$

Alternative hypothesis H_1 $: \rho > 0.30$

Level of significance $\alpha = 0.01$. Then,

a. H_0 is accepted

b. H_0 is rejected

c. It is two tailed tests

d. None of these

Q48 In case of perfect correlation both the lines of regression

a. Are perpendicular to each other

b. Are coincident

c. Make angle of $\frac{\pi}{4}$ with each other

d. Make angle of $\frac{\pi}{6}$ with each other

Q49 If $P(A) = 0.4,\ P(B) = 0.8$ and $P\left(\frac{B}{A}\right) = 0.6$, then $P(A \cup B)$ is equal to

a. 0.24

b. 0.3

c. 0.48

d. 0.96

Q50 For two events $A_1\ and\ A_2$ if $P(A_1) = \frac{2}{3}, P(A_2) = \frac{3}{8}\ and\ P(A_1 \cap\ A_2) = \frac{1}{4}$, then A_1 and A_2 are:

a. Mutually exclusive but not independent

b. Mutually exclusive and independent

c. Independent but not mutually exclusive

d. Not mutually exclusive and not independent

Q51 What is the rank of the matrix

$$A = \begin{bmatrix} 5 & 2 & 1 \\ 1 & 3 & 2 \\ 2 & 6 & 4 \end{bmatrix}$$

a. 0

b. 1

c. 2

d. 3

Q52 The dimension of the vector space V= $\{A=(a_{ij})_{n\times n} : a_{ij} \in C,\ a_{ij} = -a_{ji}\}$ over the field R is

a. n^2

b. n^2-1

c. n^2+n

d. $n^2/2$

Q53 Let A bean 3×3 matrix with eigen values 1, -1, 0. Then the determinant of $I+A^{99}$ is

a. 0

b. 4

c. 9

d. 10

Q54 Let A be a non zero upper triangular matrix whose all eigen values are 0. Then I + A is

a. Invertible

b. Singular

c. Idempotent

d. Nilpotent

Q55 Let $x + y + z = 0$, $x - y - z = 0$, then the number of solutions of this system of equation is

a. Unique solution.

b. infinitely many solutions

c. finitely many but greater than 2.

d. No solution

Q56 The function $f(z) = \frac{z}{(z^2+4)^2}$ has

a. Removable singularity

b. Essential singularity

c. Simple pole at $z = 2i \; and \; z = -2i$

d. Poles of order 2 $z = 2i \; and \; z = -2i$

Q57 Consider the function $f(z) = x^2 + iy^2 \; and \; g(z) = x^2 + y^2 + ixy$. At $z = 0$

a. f is analytic but not g

b. g is analytic but not f

c. both f and g are analytic

d. neither f or g is analytic

Q58 The integral $\int_{|z|=2\pi} \frac{\sin z}{(z-\pi)^2} \, dz$, (where the curve is taken anticlockwise) equals to

a. $-2\pi i$

b. 0

c. $2\pi i$

d. $4\pi i$

Q59 Let $f(z) = \frac{1}{z^2-3z+2}$, Then the coefficient of $\frac{1}{z^3}$ in the Laurent expansion of $f(z) for \; |z| > 2$ is

a. 0

b. 1

c. 3

d. 5

Q60 The residue of the function $f(z) = \frac{\sin z}{z^8}$ at $z = 0$ is

a. $\frac{-1}{7!}$

b. $\frac{1}{7!}$

c. 0

d. 1

Q61 Let $f(z) = \frac{1+z}{1-z}$

Which of the following is true?

a. Maps $\{|z| < 1\}\ onto\ \{Re(z) < 0\}$

b. Maps $\{|z| < 1\}$ $\boldsymbol{onto}$ $\{\boldsymbol{Re(z) > 0}\}$

c. Maps $\{|z| < 1, Im(z) < 0\}\ onto\ \{Re(z) < 0, Im(z) < 0\}$

d. Maps $\{|z| > 1\}\ onto\ \{Im(z) > 0\}$

Q62 The solution of the differential equation $\frac{dy}{dx} = \frac{1-x}{y}$ represents

a. A family of circles centered at (1,0)

b. A family of circles centered at (0,0)

c. A family of circles centered at (-1,0)

d. A family of straight lines with slope -1.

Q63 The differential equation whose linearly independent solutions are cos 2x, sin 2x, e^x,is

a. $(D^3 + D^2 + 4D)y = 0$

b. $\boldsymbol{\left(D^3 - D^2 + 4D - 4\right)y = 0}$

c. $(D^3 + D^2 - 4D - 4)y = 0$

d. $(D^3 - D^2 - 4D + 4)y = 0$

Q64 The particular solution of the differential equation $(1 + x)(1 - x)\frac{dy}{dx} = 2y\ ; y(0) = 4\ is$

a. $\boldsymbol{y(x) = 4\frac{(1+x)}{(1-x)}}$

b. $y(x) = 4\frac{(1-x)}{(1+x)}$

c. $y(x) = 4\frac{(2+x)}{(2-x)}$

d. $y(x) = 4\frac{(-1+x)}{(-1-x)}$

Q65 An integrating factor of the differential equation $(1 + x^3)dy + (x^2y + \sin x + \tan x)dx = 0$ is

a. $\sqrt[3]{x^3 - 1}$

b. $\sqrt{x^3} + 1$

c. $\sqrt[4]{x^3 + 1}$

d. $\boldsymbol{\sqrt[3]{x^3 + 1}}$

Q66 For what values of $a\ and\ b$ the given differential equation $(ax^2 + 2y\ sin\ x)\frac{dy}{dx} + 6xy + by^2 \cos x = 0$ will be exact

a. $a = 6, b = 1$

b. $\boldsymbol{a = 3, b = 1}$

c. $a = 1, b = 6$

d. $a = 2, b = 3$

Q67 If $y(x)$ be the solution of the differential equation $\frac{dy}{dx} = e^{x-y} - 1, y(0) = 0.$

Then which of the following is true?

a. $y = e^{\frac{1}{x}}$

b. $e^{x+y} = e^{2x}$

c. $e^{x+y} = e^{2x} + y$

d. $\boldsymbol{2e^{x+y} = e^{2x} + 1}$

Q68 If a continuous random variable X, has probability density function $f(x) = \begin{cases} \frac{1}{3}, -1 \leq x < 0 \\ \frac{2}{3}, \ 0 \leq x \leq 1 \end{cases}$

Then $E(x^2)$ is equal to

a. 1/9

b. 2/3

c. 5/12

d. 1/3

Q69 Suppose E and F are two events of a random experiment. If the probability of occurrence of E is 1/5 and the probability of occurrence of F given E is 1/10, then the probability of non-occurrence of at least one of the events E and F is

a. 1/18

b. 1/2

c. 49/50

d. 1/50

Q70 Let P be a matrix of order $m \times n$ and Q be a matrix of order $n \times p$. If rank (P) = nand $rank(Q) = p$. Then $rank(PQ)$ is

a. n

b. p

c. np

d. n+p

Q71 Let $M = \begin{bmatrix} 1 & 1 & 0 \\ -1 & 1 & 2 \\ 2 & 2 & 0 \\ -1 & 0 & 1 \end{bmatrix}$. Then $rank(M)$ is equal to

a. 3

b. 4

c. 2

d. 1

Q 72 The characteristic polynomial of the 3×3 real matrix $A = \begin{bmatrix} 0 & 0 & -c \\ 1 & 0 & -b \\ 0 & 1 & -a \end{bmatrix}$ is

a. $\boldsymbol{\lambda^3 + a\lambda^2 + b\lambda + c}$

b. $(\lambda - a)(\lambda - b)(\lambda - c)$

c. $(\lambda - 1)(\lambda - abc)^2$

d. $(\lambda - 1)^2(\lambda - abc)$

Q 73 Let T be linear transformation on R^2 into itself such that $T(1,0) = (1,2)$ and $T(1,1) = (0,2)$. Then $T(a,b)$ is equal to

a. (a,2b)

b. (2a, b)

c. (a-b, 2a)

d. (a-b, 2b)

Q74 If $X = AY$, where $A = \frac{1}{\sqrt{2}}\begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$; $X = (x_1, x_2)^T$ and $Y = (y_1, y_2)^T$; then $x_1^2 + x_2^2$ transforms to

a. $\sqrt{2}(y_1^2 + y_2^2)$

b. $(\boldsymbol{y_1 - y_2})^2$

c. $y_1^2 + y_1 y_2 + y_2^2$

d. $(y_1^2 + y_2^2)$

Q75 If λ is an eigen value of symmetric matrix, then

a. λ is pure imaginary

b. λ is complex

c. $\boldsymbol{\lambda}$ is real

d. None of these

Q76 The residue of the function $f(z) = \frac{1}{(z+2)^2\,(z-2)}$ at $z = 2$ is

a. $\mathbf{\frac{-1}{32}}$

b. $\frac{-1}{16}$

c. $\frac{1}{16}$

d. $\frac{1}{32}$

Q77 The pole of the function $f(z) = \frac{z^2}{(z-1)^2(z+2)}$ is

a. **at $z = -2$**

b. at $z = -1$

c. at $z = 1$

d. at $z = 2$

Q78 If $f(z) = \frac{1-e^z}{1+e^z}$, then at $z = \infty$, $f(z)$ have

a. pole

b. removable singularity

c. **non-isolated singularity**

d. isolated singularity

Q79 If $a,\ a^{-1} \in G$, a group and order of a and $a^{-1}$are m and n respectively, then

a. m > n

b. m < n

c. **m=n**

d. none of these

Q80 How many elements x in the field Z_{11}satisfy the equation $x^{12} - x^{10} = 2$?

a. 1

b. **2**

c. 3

d. 4

Q81 The number of elements of order 10 in Z_{30} is

a. 2

b. 3

c. 4

d. 5

Q82 The following table defines a cyclic group:

$\star$	A	B	C	D
A	C	A	D	B
B	A	B	C	D
C	D	C	B	A
D	B	D	A	C

It's generators are

a. A, B

b. D, B

c. C, D

d. D, A

Q83 The value of $f(3)$ from the following table using the Lagrange's Formula is

x	0	1	2	4	5	6
$f(x)$	1	14	15	5	6	19

a. 10

b. 10.5

c. 11

d. 11.5

Q84 Let $x^2 - 117 = 0$. The iterative steps for the solution using Newton-Raphson's method is given by

a. $\boldsymbol{x_{\{k+1\}} = \frac{1}{2}\left(x_k + \frac{117}{x_k}\right)}$

b. $x_{\{k+1\}} = x_k - \frac{117}{x_k}$

c. $x_{\{k+1\}} = x_k - \frac{x\_k}{117}$

d. $x_{\{k+1\}} = \frac{1}{2}\left(x_k - \frac{117}{x_k}\right)$

Q85 If X has a Binomial distribution, then $M_X(t)$ (Moment generating function) is equal to

a. np

b. npq

c. np^2q

d. $(\boldsymbol{q + pe^t})^{\boldsymbol{n}}$

Q86 A cyclic group having exactly one generator can have at most

a. 3 elements

b. 2 elements

c. 4 elements

d. 1 elements

Q87 The $p.d.f.$ of a continuous random variable is $f(x) = \begin{cases} 0, & x < 2 \\ \frac{3+2x}{18}, & 2 \le x \le 4. \\ 0, & x > 4 \end{cases}$ The probability that x will lies between $2 \le x \le 3$ is

a. 4/9

b. 2/9

c. 5/9

d. 7/9

Q88 If a system of equations $\lambda x + y + z = 1, x + \lambda y + z = 1 \text{and } x + y + \lambda z = 1$ is inconsistent, then λ can be

a. 1

b. 2

c. -2

d. -1

Q89 If a system of equations $x + y = 3, (1+k)x + (2+k)y = 8$ and $x - (1+k)y + (2+k) = 0$ is consistent, then the values of k are

a. 0, 1

b. 1, -5/3

c. -1, 1/3

d. 2/3, -1

Q90 If the mean of a Poisson distribution is 0.5, then the ratio of $P(X = 3)$ to $P(X = 2)$ is:

a. 1:8

b. 1:2

c. 1:6

d. 1:4

Q91 If $f(z) = (x^2 + axy + by^2) + i(cx^2 + dxy + y^2)$ is a analytic function of z, then the values of a, b, c and d are:

a. a = 2 , b =-1, c = -1, d = 4

b. a = 2 , b =-1, c = -1, d = 2

c. a = -2 , b =1, c = -1, d = 2

d. a = 2 , b =1, c = -1, d = -2

Q92 If F(s) is the Fourier transform of a function f(x), then the Fourier transform of f(2x) is given by:

a. $F(s-2)$

b. $e^{2is}\,F(s)$

c. $\frac{1}{2}\,F(\frac{s}{2})$

d. $\frac{1}{2}\,F\left(\frac{2}{s}\right)$

Q93 If the Laplace transform of a function f(t) is $\frac{1}{s(s+a)}$, then f(t) is equal to:

a. $a\,e^{-at}$

b. $\frac{1}{a}(1 - e^{-at})$

c. $1 - e^{-at}$

d. $\frac{1}{a}e^{-at}$

Q94 The function $f(x,y) = x^3 + y^3 - 63(x+y) + 12xy$ attains minimum at the point:

a. (3, 3)

b. (-1, 5)

c. (5, -1)

d. (-7, -7)

Q95 Which of the following vectors form a basis for the vector space R^3 ?

a. (1, 2, -1) and (1, -1, 5)

b. (2, 4, -3), (0, 1, 1) and (0, 1, -1)

c. (1, 2, 3), (1, 0, -1), (3, -1, 4) and (2, 1, 1)

d. (1,3, -4), (1, 4, -3) and (2, 3, -11)

Q96 The maximum and minimum value of $5x + 7y$, when $|x| + |y| \leq 1$ are

a. 5 and -5

b. 7 and -7

c. 5 and -7

d. 7 and -5

Q97 Let G be a group of order 77. Then G/Z(G) is isomorphic to

a. $\mathbb{Z}_{\mathbf{1}}$

b. $\mathbb{Z}_7$

c. $\mathbb{Z}_{11}$

d. $\mathbb{Z}_{77}$

Q98 Let $T: \mathbb{R}^n \to \mathbb{R}^n$ be a linear transformation. Which of the following statements implies that T is bijective?

a. $Nullity(T) = n$

b. $Rank(T) + Nullity(T) = n$

c. $Rank(T) = Nullity(T) = n$

d. $\boldsymbol{Rank(T) - Nullity(T) = n}$

Q99 Which of the following is true?

a. A Cauchy sequence need not be monotonic

b. If $< a_n >, < b_n >$ are Cauchy then $c_n = |a_n - b_n|$ need not be Cauchy

c. If $< a_n >$ is a bounded sequence such that every convergent subsequence of $< a_n >$ converges to same limit $a \in \mathbb{R}$ then $< a_n >$ need not to converge to a.

d. None of these

Q100 Let $f(x) = x^5 - 5x + 2$. Then

a. f has no real root

b. f has exactly one real root

c. all roots of f are real

d. f has exactly three real roots

Correct Option is marked in bold

Q1 What is the primary purpose of a p-value in hypothesis testing?

a. To measure the effect size

b. To determine the strength of the correlation

c. **To assess the likelihood of obtaining the observed data, assuming the null hypothesis is true**

d. To estimate the population parameter

Q2 Which of the following measures the variability or spread of a data set?

a. Mean

b. Mode

c. Standard deviation

d. Median

Q3 What type of data is categorized into distinct categories without any order?

a. Ordinal

b. Interval

c. Nominal

d. Ratio

Q4 In a study, a Type I error refers to:

a. Failing to reject a false null hypothesis

b. Rejecting a true null hypothesis

c. Accepting the null hypothesis when it is false

d. The inability to detect an effect when one exists

Q5 In a normally distributed data set, what percentage lies within two standard deviations of the mean?

a. 68%

b. 75%

c. 95%

d. 99%

Q6 Which statistical test is used to compare the means of two independent groups?

a. Chi-square test

b. T-test

c. ANOVA

d. Correlation coefficient

Q7 What is a confidence interval?

a. A range of values within which the population parameter is likely to fall

b. The exact value of the population parameter

c. The probability of the hypothesis being true

d. The frequency of observations in a data set

Q8 Which of the following is an example of a continuous variable?

a. Blood group

b. Gender

c. Height

d. Marital status

Q9 What does a correlation coefficient of -0.8 indicate?

a. A very weak positive correlation

b. A strong negative correlation

c. No correlation

d. A moderate positive correlation

Q10 Which of the following is a characteristic of a good sample in a study?

a. Very small to reduce costs

b. Randomly selected to minimize bias

c. Only healthy individuals

d. Extreme values of the population

Q11 What is the primary objective of research methodology?

a. To test hypotheses

b. To describe a research topic

c. To collect data

d. To establish a research framework

Q12 What does the term "variable" refer to in research?

a. A fixed quantity

b. An element that can change

c. A research design

d. A method of data collection

Q13 Which of the following is NOT a characteristic of a hypothesis?

a. It is testable

b. Based on existing knowledge

c. Cannot be disproven

d. Suggests a relationship between variables

Q14 Which is NOT an ethical guideline in research?

a. Getting informed consent

b. Participants must complete the study

c. Anonymity of participants

d. Right to withdraw at any time

Q15 Which of the following is a qualitative research method?

a. Randomised Controlled Trial

b. Structured survey

c. Focus group discussion

d. Lab experiment

Q16 What is the independent variable in an experiment?

a. Measured variable

b. Manipulated variable

c. Constant

d. Excluded variable

Q17 Which of the following is primary data?

a. Historical records

b. Surveys by researcher

c. Published articles

d. Government reports

Q18 Where is random sampling most used?

a. Qualitative research
b. Quantitative research
c. Case studies
d. Ethnographic research

Q19 What is the purpose of a literature review?

a. Identify gaps in knowledge
b. Write findings
c. Gather data
d. Present the research question

Q20 What does "reliability" in research mean?

a. Accurate measurement
b. Consistent results
c. Truthfulness of data
d. Generalizability

Q21 A disadvantage of cross-sectional studies is:

a. Time-consuming
b. Cannot establish causality
c. Large samples
d. Difficult to interpret

Q22 A double-blind study means:

a. Everyone knows treatment
b. Only researchers know
c. Neither participants nor researchers know
d. Only participants know

Q23 What does "sampling bias" mean?

a. Diverse participants
b. Random selection
c. Unrepresentative data
d. Controlling variables

Q24 Major advantage of longitudinal studies is:

a. Cheaper
b. Determine causality
c. Fewer participants
d. No ethics approval

Q25 What is the dependent variable in an experiment?

a. Manipulated variable
b. Measured variable
c. Not changed
d. Excluded

Q26 Which validity measures the concept intended?

a. External
b. Construct
c. Reliability
d. Internal

Q27 Purpose of a control group is to:

a. Increase sample
b. Compare with untreated group
c. Avoid randomization
d. Ensure ethics

Q28 First step in research is:

a. Data collection
b. Literature review
c. Define problem
d. Statistical analysis

Q29 "PICO" stands for:

a. Prognosis, Investigation, Control, Outbreak
b. Phenomenon, Investigation, Consequence, Occurrence
c. Population, Intervention, Control, Outbreak
d. Population, Intervention, Comparison, Outcome

Q30 Behavior change due to observation is called:

a. Berkson Bias
b. Observer Bias
c. Hawthorne Bias
d. Reporting Bias

Q31 In positively skewed distribution:

a. Mode = Median = Mean
b. Mode < Median < Mean
c. Mean < Median < Mode
d. Median < Mode < Mean

Q32 95% confidence interval is significant when:

a. p value is more than .05
b. p value is 1
c. p value is less than .05
d. p value is =.05

Q33 Type-2 error is also called:

a. False positive
b. Power
c. Confidence interval
d. P-value

Q34 In a clinical trial, DSMB stands for:

a. Data Service Management Board
b. Data Safety Management Board
c. Data and Safety Monitoring Board
d. Data Service Monitoring Board

Q35 Sampling frame is a list of:

a. Sampling methods
b. Sampling units
c. Statistical tests

d. None of the above

Q36 Non-parametric alternative to unpaired t-test:

a. Sign test
b. Wilcoxon signed-rank test
c. Levene's test
d. Mann-Whitney U test

Q37 Non-parametric alternative to paired t-test:

a. Mann-Whitney U test
b. Wilcoxon signed-rank test
c. Wilcoxon rank sum test
d. Kruskal-Wallis test

Q38 Another name for rank correlation:

a. Pearson correlation
b. Spearman correlation
c. Partial correlation
d. Serial correlation

Q39 Test for comparing two variances:

a. t-test
b. Chi-square
c. Z-test
d. F-test

Q40 Diagrams used to check normality include:

a. Box plot
b. Q-Q plot
c. Histogram
d. All of the above

Q41 Which scale has a natural zero?

a. Ratio
b. Nominal
c. Ordinal

d. Interval

Q42 Funnel plot helps detect:

a. Publication bias

b. Risk of bias

c. Attrition bias

d. Observation bias

Q43 Degrees of freedom for paired t-test (n pairs):

a. 2n – 1

b. n – 1

c. n – 2

d. 2(n - 1)

Q44 In a survey, who provides answers?

a. Guide

b. Supervisor

c. Respondent

d. Messenger

Q45 Most comprehensive population data source:

a. Census

b. National Sample Survey

c. National Health Survey

d. Demographic Health Survey

Q46 Checklist for observational study reporting:

a. STROBE

b. CONSORT

c. PRISMA

d. All of the above

Q47 Using data from a national survey is:

a. Primary data

b. Secondary data

c. Census
d. All of the above

Q48 Stem and leaf is a:

a. Statistical test
b. Sampling method
c. Statistical plot
d. Study design

Q49 Which test compares multiple group means?

a. t-test
b. ANOVA
c. Z-test
d. Chi-square

Q50 Which test is used for association between two categorical variables?

a. Chi-square
b. ANOVA
c. t-test
d. Z-test

Q51 Cellular nucleus was discovered by

a. Anton Von Leeuwenhoek
b. Robert Brown
c. Matthias Schleiden
d. Rudolf Virchow

Q52 Which organelle is present in both Prokaryotic as well as Eukaryotic cells?

a. Golgi complex
b. Mitochondria
c. Ribosomes
d. Vacuoles

Q53 Which was the first hormone to be discovered?

a. Insulin

b. Secretin

c. Glucocorticoid

d. Thyroid

Q54 Which of the following statements is correct about mesosomes?

a. They are also present in eukaryotic cells

b. They have no role in cell wall formation

c. They are infoldings of cell membrane

d. All the above

Q55 Which of the following is a characteristic feature of the plasma membrane in eukaryotic cells?

a. It is a rigid structure composed of cellulose.

b. It is composed of a phospholipid bilayer with embedded proteins

c. It contains a single layer of phospholipids

d. It is impermeable to all ions and molecules.

Q56 Which of the following organelle is responsible for the synthesis of ribosomal RNA (rRNA)?

a. Golgi Apparatus

b. Nucleolus

c. Endoplasmic Reticulum

d. Mitochondrion

Q57 Which of the following statements about mitochondria is true?

a. Mitochondria are the site of protein synthesis in the cell.

b. Mitochondria have their own DNA and can replicate independently of the nucleus.

c. Mitochondria are not involved in the synthesis of lipids.

d. Mitochondria are present in all prokaryotic cells.

Q58 Which phase of the cell cycle is characterized by DNA replication?

a. G1 phase

b. S phase

c. G2 phase

d. M phase

Q59 Which of the following occurs during prophase I of meiosis that does not occur during mitosis?

a. Chromosomes condense
b. Crossing over occurs between homologous chromosomes
c. The nuclear envelope breaks down
d. Chromosomes align at the metaphase plate

Q60 Which of the following statements is false about facilitated diffusion?

a. It does not require energy in the form of ATP
b. It occurs down the concentration gradient
c. It follows saturation kinetics.
d. It does not require any membrane proteins.

Q61 What is the outcome of meiosis?

a. Two genetically identical diploid
b. Four genetically distinct haploid cells
c. Two genetically distinct diploid cells
d. Four genetically identical diploid cells

Q62 Which of the following statements best describes the role of cyclins in the regulation of the cell cycle?

a. Cyclins degrade DNA at specific checkpoints
b. Cyclins activate cyclin-dependent kinases (CDKs), which control progression through the cell cycle.
c. Cyclins inhibit the activity of kinases during cell division.
d. Cyclins prevent mitosis from occurring until DNA is fully replicated.

Q63 Which of the following is NOT a function of the liver?

a. Synthesis of Albumin
b. Excretion of bilirubin
c. Synthesis of gamma globulins
d. Detoxification of harmful substances

Q64 In the exchange of gases at the alveolar level, oxygen moves from the alveoli to the blood via:

a. Active transport
b. Facilitated diffusion

c. Osmosis

d. Simple diffusion

Q65 In blood circulation, the term "double circulation" refers to the separation of:

a. Pulmonary and systemic circuits

b. Oxygenated and deoxygenated blood

c. Arterial and venous blood

d. Blood and lymph

Q66 Which of the following blood group is universal recipient?

a. O -

b. AB -

c. O+

d. AB +

Q67 What is the function of the countercurrent mechanism in the nephron?

a. To increase blood flow in the glomerulus

b. To maintain the osmotic gradient in the medulla for water reabsorption

c. To filter out glucose and proteins

d. To increase blood pressure

Q68 Which of the following structures is responsible for transmitting a nerve impulse across a synapse?

a. Dendrite

b. Axon terminal

c. Myelin sheath

d. Synaptic vesicle

Q69 Which type of joint allows for rotational movement around a single axis?

a. Ball-and-socket joint

b. Hinge joint

c. Pivot joint

d. Saddle joint

Q70 Which of the following statements is true regarding spermatogenesis?

a. Spermatogenesis results in the formation of one functional sperm cell from one primary spermatocyte

b. Spermatogenesis occurs in the testes under the control of FSH and LH

c. Spermatogenesis is a one-step process that results in four non-motile sperm cells

d. Spermatogenesis starts before puberty but occurs throughout the life of a male

Q71 During the menstrual cycle, which hormone is responsible for the thickening of the endometrial lining in preparation for implantation?

a. Estrogen

b. Progesterone

c. Luteinizing hormone (LH)

d. Follicle-stimulating hormone (FSH)

Q72 Saltatory Nerve conduction is

a. Slow and occurs in unmyelinated neurons

b. Fast and occurs in unmyelinated neurons

c. Slow and occurs in myelinated neurons

d. Fast and occurs in myelinated neurons

Q73 What is the main function of colostrum produced during the first few days after childbirth?

a. It provides a high fat content for newborn nutrition

b. It contains antibodies that help protect the newborn

c. It helps stimulate the newborn's respiratory system

d. It is a source of fiber for the newborn

Q74 Surfactant is found in

a. Trachea

b. Terminal Bronchioles

c. Alveoli

d. Connective tissue of lungs

Q75 Which of the following is the main function of the hormone progesterone in the menstrual cycle?

a. Stimulating the release of the egg from the ovary

b. Stimulating the production of milk

c. Maintaining the endometrial lining for possible implantation

d. Triggering the shedding of the endometrial lining

Q76 Which of the following is a common strategy used to prevent sexually transmitted infections (STIs)?

a. Hormonal contraception

b. Barrier methods like condoms

c. Intrauterine device (IUD)

d. Coitus interruptus

Q77 Which of the following is a potential side effect of using hormonal birth control methods for an extended period?

a. Decreased risk of ovarian cancer

b. Increased risk of heart disease

c. Weight loss

d. Increased fertility after stopping use

Q78 Which of the following is true about innate immunity?

a. It is specific to pathogens

b. It is acquired through exposure to pathogens

c. It involves the production of antibodies

d. It is the first line of defense and is nonspecific

Q79 What is the primary difference between active and passive immunity?

a. Active immunity involves the transfer of antibodies, while passive immunity involves the body’s own immune response

b. Active immunity is a natural defense, while passive immunity is artificial

c. Active immunity is acquired through vaccines, while passive immunity involves direct exposure to pathogens

d. Active immunity involves the body's response to antigens, while passive immunity involves the transfer of antibodies

Q80 Enteric fever is caused by which type of microorganism?

a. Virus

b. Bacterium

c. Fungus

d. Protozoa

Q81 Which of the following diseases is most commonly associated with the ingestion of contaminated water or food?

a. Tuberculosis

b. Cholera

c. Malaria

d. Pneumonia

Q82 Which of the following is a non-communicable disease caused by the malfunction of the body's immune system, particularly in response to allergens?

a. Asthma

b. Malaria

c. Tuberculosis

d. Typhoid

Q83 Which cells are primarily targeted and destroyed by the HIV virus in the human body?

a. Red blood cells

b. B lymphocytes

c. Helper T cells

d. Neutrophils

Q84 Which of the following is a genetic disorder caused by a dominant allele?

a. Cystic fibrosis

b. Huntington's disease

c. Duchenne muscular dystrophy

d. Phenylketonuria

Q85 Which of the following is a common effect of long-term drug abuse on the brain?

a. Decreased tolerance to pain

b. Increased production of serotonin

c. Improved cognitive function

d. Disruption in the natural balance of neurotransmitters

Q86 The major muscle involved in quiet inspiration is ?

a. Diaphragm

b. Internal intercostal muscle
c. Platysma
d. External Intercostal muscle

Q87 BCG is a vaccine containing

a. Antibodies against tubercular bacteria
b. Live attenuated tubercular bacteria
c. Antibiotics against tubercular bacteria
d. Dead tubercular bacteria

Q88 Deficiency of which vitamin causes night blindness?

a. K
b. B
c. D
d. A

Q89 Dengue is a _____ infection.

a. Bacterial
b. Fungal
c. Viral
d. Parasitic

Q90 Which of the following statements is true about recombinant DNA technology?

a. It involves the use of organic molecules to produce genetically identical organisms
b. It allows the modification of the genetic material of organisms to produce desired traits
c. It is limited to only plants and has no use in animals or microorganisms
d. It is only applicable in the production of vaccines

Q91 What is the principle behind the use of plasmids in genetic engineering?

a. Plasmids act as vectors to transfer foreign genes into host cells
b. Plasmids create mutations in the host organism to enhance growth
c. Plasmids are used to degrade unwanted DNA in the host
d. Plasmids serve as primers for DNA replication in host cells

Q92 Which enzyme is used to synthesize complementary DNA (cDNA) from an mRNA template in genetic research?

a. RNA polymerase
b. DNA ligase
c. Reverse transcriptase
d. DNA polymerase

Q93 Which of the following techniques is used to separate DNA fragments based on their size?

a. Gel electrophoresis
b. Southern blotting
c. Western blotting
d. Polymerase chain reaction

Q94 Gene therapy aims to treat diseases by:

a. Using drugs to modify genetic material in the body
b. Introducing a correct copy of the defective gene into the patient's cells
c. Replacing damaged tissues with healthy tissues
d. Blocking the expression of harmful genes in the body

Q95 Cardiac Output is

a. The amount of blood pumped by each ventricle in one cardiac cycle
b. The amount of blood pumped by both ventricles in one cardiac cycle
c. The amount of blood pumped by each ventricle in one minute
d. The amount of blood pumped by both ventricles in one minute

Q96 Which of the following is an application of ELISA in clinical diagnostics?

a. Detecting gene mutations in genetic disorders
b. Identifying the DNA sequence of a pathogen
c. Measuring the concentration of antibodies in the serum of a patient
d. All the above

Q97 The major ion in intracellular fluid is

a. Sodium
b. Potassium
c. Chloride

d. Bicarbonate

Q98 What is the role of creatine supplementation in short-term high-intensity activities?

a. Increases the regeneration of ATP

b. Improves aerobic capacity

c. Enhances fat oxidation

d. Reduces muscle protein breakdown

Q99 Which of the following best describes the mechanism of action of oxytocin during lactation?

a. It promotes milk production in the alveolar cells.

b. It promotes the contraction of smooth muscle in the uterus.

c. It increases the blood flow to the breasts

d. It stimulates the release of milk from the mammary glands.

Q100 The milk ejection reflex is triggered by the stimulation of which receptor in the nipple?

a. Baroreceptors

b. Thermoreceptors

c. Mechanoreceptors

d. Chemoreceptors

Correct Options are given in Table on Page 18

Q1 Z-score indicates:

a. Standard deviation unit distance
b. Randomness
c. Center of distribution
d. Power of the test

Q2 A literature review is successful only if it:

a. Ends with a well-defined research gap
b. Includes >100 references
c. Focuses on general knowledge
d. Avoids criticisms of previous work

Q3 Type-I error occurs when:

a. A false null hypothesis is accepted
b. A true null hypothesis is rejected
c. Hypothesis is not tested
d. Data is skewed

Q4 Continuous data in pharmaceutical research (e.g., dissolution % vs. time) is best represented using:

a. Tally chart
b. Histogram
c. Pie chart
d. Bar chart

Q5 A normal distribution is:

a. Symmetric bell-shaped
b. Bimodal
c. Skewed
d. Uniform

Q6 A fair coin is tossed. Sample space has:

a. 2 outcomes
b. 3 outcomes
c. 6 outcomes

d. 4 outcomes

Q7 Hypothesis that assumes no difference between groups is called:

a. Alternate hypothesis
b. Null hypothesis
c. Clinical hypothesis
d. Working hypothesis

Q8 ANOVA stands for:

a. Analysis of Variety
b. Analysis of Variance
c. Analysis of Variables
d. None

Q9 A research question must be:

a. Imaginary
b. Non-measurable
c. Opinion-based only
d. Measurable and researchable

Q10 Level of significance typically used in research is:

a. 50
b. 0.5
c. 5
d. 0.05 or 0.01

Q11 Plagiarism refers to:

a. Publishing in multiple journals at once
b. Misinterpretation of statistical results
c. Reproducing another's work without giving credit
d. Using open-source data

Q12 Paired t-test is applied when:

a. Two groups are unrelated
b. Same subjects tested twice

c. Sample size is very large

d. For nominal data

Q13 Distribution of sample mean follows:

a. Bayes theorem

b. Bernoulli theorem

c. Central limit theorem

d. Null theorem

Q14 Degree of freedom depends on:

a. Research duration

b. Sample size

c. P-value

d. Experimental design only

Q15 Rejecting H_0 when it is true leads to:

a. Type I error

b. Type II error

c. Power error

d. Beta reduction

Q16 Events that cannot occur simultaneously are called:

a. Independent

b. Mutually exclusive

c. Exhaustive

d. Conditional

Q17 The need for research in pharmaceutical sciences includes:

a. New drug discovery

b. Enhancing dosage forms

c. Improving patient care

d. All of the above

Q18 A variable that is controlled in research is called:

a. Extraneous variable

b. Dependent variable
c. Independent variable
d. Controlled variable

Q19 In pharmaceutical studies, ethical considerations are crucial mainly because:

a. Human/animal subjects may be involved
b. They delay research
c. They increase budget
d. They reduce novelty

Q20 Which distribution applies to success/failure data?

a. Poisson
b. Binomial
c. Normal
d. Exponential

Q21 Type I error symbol is:

a. α
b. β
c. μ
d. σ

Q22 Which statement about probability is correct?

a. Probability can be negative
b. Probability lies between 0 and 1
c. Probability is independent of mathematical rules
d. Sum of all probabilities in a sample space > 1

Q23 Degree of freedom in t-test with n samples:

a. n+1
b. n–1
c. 2n
d. n

Q24 A new formulation improves patient adherence. This statement in research is treated as:

a. A hypothesis
b. A conclusion
c. A result
d. An objective

Q25 Which of the following is typically the first step in writing a grant proposal?

a. Graphical representation
b. Designing statistical tests
c. Identifying the research problem
d. Analyzing data

Q26 IAEC stands for:

a. Institutional Academic Executive Committee
b. Indian Academic Evaluation Council
c. International Animal Ethical Charter
d. Institutional Animal Ethics Committee

Q27 A study protocol mainly describes:

a. Personal qualifications
b. Detailed study plan
c. Color of graphs
d. Journal impact factor

Q28 A short summary of Technical Paper is called:

a. Research Abstract
b. Article
c. Publication
d. Guide

Q29 Analogies are sources of:

a. Research
b. Data
c. Concept
d. Hypothesis

Q30 Which source is considered a primary source of literature?

a. News articles
b. Review articles
c. Textbooks
d. Research articles from peer-reviewed journals

Q31 While referencing, giving credit to the original authors is known as:

a. Citation
b. Replication
c. Translation
d. Reposting

Q32 Bayes' theorem deals with:

a. Posterior probability
b. Independent events
c. Mutually exclusive events
d. Frequency distribution

Q33 The set of all possible outcomes of a random experiment is known as:

a. Sample space
b. Event space
c. Universe
d. Probability space

Q34 If A and B are independent, then P(A/B) equals:

a. P(A)
b. P(B)
c. P(A) × P(B)
d. P(A) + P(B)

Q35 If the probability of an event A is 0, it means:

a. A is impossible
b. A is certain to occur
c. A may occur

d. Sample space is null

Q36 Test used for small sample mean comparison:

a. z-test
b. t-test
c. F-test
d. Chi-square test

Q37 A two-tailed test is used when:

a. Direction is important
b. Any direction changes matter
c. Difference must be positive
d. No hypothesis exists

Q38 Power increases when:

a. Alpha increases
b. Sample size increases
c. Effect size increases
d. All of the above

Q39 Distribution of sample mean follows:

a. Null theorem
b. Bernoulli theorem
c. Bayes theorem
d. Central limit theorem

Q40 Region where test statistic falls to reject H_0:

a. Sample region
b. Confidence interval
c. Acceptance region
d. Critical region

Q41 A one-tailed test checks for:

a. Specific direction change
b. Deviation in both directions

c. Mean always >0
d. No change

Q42 Which is NOT a type of Intellectual Property Right?

a. Copywriting
b. Patent
c. Trademark
d. Copyright

Q43 Which of the following is considered research misconduct?

a. Applying random sampling
b. Null hypothesis testing
c. Publishing review articles
d. Fabrication and falsification of data

Q44 A key component of financial planning in proposals is:

a. Literature classification
b. Budget justification
c. Data interpretation
d. Table of contents

Q45 The decision rule in hypothesis testing is based on:

a. Sample size only
b. DOF only
c. P-value vs alpha
d. Z-table only

Q46 Statistical significance is usually accepted at:

a. $p > 0.05$
b. $p = 5.0$
c. $p < 0.05$
d. $p = 0.5$

Q47 Which type of chart is best to show a trend in drug release profile over time?

a. Line graph

b. Pie chart
c. Histogram
d. Box plot

Q48 Chi-square test is invalid when:

a. Expected frequencies very low
b. Mean difference small
c. Variance unchanged
d. Data continuous

Q49 Z-test is used when:

a. Population standard deviation known
b. Sample size is small
c. For categorical data
d. Variances unequal

Q50 Null hypothesis is:

a. A statement that researcher wants to disprove
b. A statement researcher wants to prove
c. Always directional
d. Statistical test itself

Q51 The typical wavelength range for UV region is:

a. 100–200 nm
b. 200–400 nm
c. 400–800 nm
d. 800–1200 nm

Q52 Tamoxifen acts as a selective estrogen receptor modulator by:

a. Degrading estrogen
b. Binding ER and blocking transcription in breast tissue
c. Enhancing aromatase activity
d. Inhibiting progesterone receptor

Q53 The IR region used for functional group identification is:

a. 400–700 nm
b. 4000–400 cm^{-1}
c. 200–800 nm
d. 100–500 cm^{-1}

Q54 Dicoumarol exerts anticoagulant effect by:

a. Direct thrombin inhibition
b. Inhibiting vitamin K epoxide reductase
c. Enhancing fibrinogen synthesis
d. Blocking platelet ADP receptors

Q55 Carbapenems are preferred in severe infections because:

a. They are acid-labile
b. They are resistant to most β-lactamases
c. They have low tissue penetration
d. They are orally inactive only

Q56 The splitting of NMR signals occurs due to:

a. Spin-spin coupling
b. Chemical shift
c. Shielding
d. Magnetic field only

Q57 COSY is a:

a. Homonuclear correlation
b. Heteronuclear correlation
c. Long-range only
d. Proton decoupled

Q58 Which of the following is a nucleoside reverse transcriptase inhibitor (NRTI)?

a. Efavirenz
b. Zidovudine (AZT)
c. Ritonavir
d. Oseltamivir

Q59 The McLafferty rearrangement involves:

a. Proton transfer
b. Transfer of a γ-hydrogen to a carbonyl oxygen
c. Homolytic cleavage of C–C bonds only
d. Radical formation in aromatic rings

Q60 3D-QSAR approaches include:

a. Hansch analysis
b. Free-Wilson analysis
c. CoMFA and CoMSIA
d. SAR analysis only

Q61 Leukotrienes (LTs) are involved in:

a. Gastric acid secretion
b. Allergic and inflammatory responses
c. Blood coagulation
d. DNA replication

Q62 Homology modeling is used to:

a. Predict protein 3D structure based on known structures of similar proteins
b. Determine ligand binding experimentally
c. Analyse ADMET properties
d. Screen virtual libraries

Q63 Time-of-Flight (TOF) MS separates ions based on:

a. Mass-to-charge ratio
b. Chemical shift
c. Electron density
d. Nuclear spin

Q64 In Gas Chromatography, retention time decreases with:

a. Increasing carrier gas flow rate
b. Increasing column length
c. Increasing stationary phase thickness
d. Decreasing temperature

Q65 Advantages of microwave-assisted reactions include:

a. Reduced reaction time
b. Increased energy consumption
c. Formation of more side products
d. Requires special toxic solvents

Q66 Metronidazole contains a:

a. Nitroimidazole ring
b. Benzimidazole
c. Triazole
d. Thiazole

Q67 Prochlorperazine is an:

a. Antipsychotic
b. Antibiotic
c. Antimalarial
d. NSAID

Q68 In column chromatography, increasing column length:

a. Decreases resolution
b. Improves resolution
c. Has no effect on separation
d. Reduces retention time

Q69 High-throughput virtual screening primarily helps to:

a. Identify potential lead compounds from large chemical libraries
b. Determine crystal structure
c. Predict toxicity in animals only
d. Synthesize compounds

Q70 Which detector is commonly used in GLC for organic compounds?

a. Flame Ionization Detector (FID)
b. UV-Visible detector
c. Refractive Index Detector
d. Conductivity detector

Q71 Drugs with high first-pass metabolism show:

a. Increased oral bioavailability
b. Decreased oral bioavailability
c. Same bioavailability
d. Longer half-life

Q72 Which of the following is not a basic principle of retrosynthesis?

a. Disconnection approach
b. Transform approach
c. Functional group interconversion
d. Random combination of reagents

Q73 An agonist is a molecule that:

a. Binds and activates a receptor
b. Blocks receptor activation
c. Only binds DNA
d. Acts as an enzyme inhibitor

Q74 Bradycardia is a common ADR of:

a. Calcium channel blockers
b. Beta-blockers
c. ACE inhibitors
d. Diuretics

Q75 A prodrug is:

a. An inactive drug converted into active form in the body
b. An antagonist drug
c. A drug with irreversible action
d. A drug that binds to DNA

Q76 Lisinopril is classified as a:

a. Beta-blocker
b. ACE inhibitor
c. Calcium channel blocker
d. Diuretic

Q77 Which drug is an H1 antihistamine?

a. Loratadine
b. Ranitidine
c. Omeprazole
d. Montelukast

Q78 Energy minimization in molecular modeling is performed to:

a. Increase molecular weight
b. Find the lowest energy conformation of a molecule
c. Measure solubility
d. Determine melting point

Q79 Losartan is effective as an antihypertensive because it:

a. Blocks angiotensin II type 1 receptors
b. Inhibits ACE enzyme
c. Increases bradykinin breakdown
d. Acts as a diuretic

Q80 What is the fundamental principle of chromatography?

a. Solubility differences
b. Differential partitioning of components between stationary and mobile phases
c. Boiling point differences
d. Magnetic properties

Q81 Alkaloids containing a tropane ring include:

a. Morphine and codeine
b. Atropine and scopolamine
c. Quinine and quinidine
d. Nicotine and caffeine

Q82 Refractive index (n) is defined as:

a. Ratio of incident to refracted angle
b. Ratio of speed of light in vacuum to speed in medium
c. Ratio of absorbed to emitted light
d. Ratio of voltage to current

Q83 Propranolol’s antiarrhythmic effect is due to:

a. Inhibition of cardiac sodium channels
b. Beta-adrenergic blockade slowing AV nodal conduction
c. Calcium channel blockade in ventricles
d. ACE inhibition

Q84 CoMFA (Comparative Molecular Field Analysis) is a method in:

a. 2D-QSAR
b. 3D-QSAR
c. Free-Wilson analysis
d. Hansch analysis

Q85 Indomethacin is used in:

a. Rheumatoid arthritis
b. Hypertension
c. Asthma
d. Depression

Q86 Which of the following is an example of a steroid?

a. Cholesterol
b. Morphine
c. Quercetin
d. Caffeine

Q87 The main functional group in steroids is:

a. Aromatic ring
b. Cyclopentanoperhydrophenanthrene
c. Pyridine
d. Lactone

Q88 Which of the following is a cholinesterase inhibitor?

a. Donepezil
b. Rivastigmine
c. Galantamine
d. All of the above

Q89 In potentiometry, a glass electrode is mainly used to measure:

a. Conductivity
b. pH
c. Redox potential
d. Optical rotation

Q90 What multiplicity will the CH_3 group show in the ^1H NMR spectrum of ethanol (CH_3CH_2OH)?

a. Singlet
b. Doublet
c. Triplet
d. Quartet

Q91 ACE inhibitor, can cause which common adverse effect?

a. Dry cough
b. Bradycardia
c. Hyperglycaemia
d. Hypokalaemia

Q92 Combes reaction is utilized for the synthesis of:

a. Pyrazoles
b. Quinoline
c. Imidazoles
d. Purines

Q93 Curare's neuromuscular blockade may be antagonized by:

a. Succinylcholine
b. Neostigmine
c. Beta-blockers
d. Calcium channel blockers

Q94 Bathochromic shift is also called:

a. Red shift
b. Blue shift
c. Hypochromic effect
d. Isosbestic point

Q95 Which of the following drugs is a non-selective β-blocker?

a. Atenolol
b. Metoprolol
c. Propranolol
d. Bisoprolol

Q96 Fluoroquinolones inhibit:

a. DNA gyrase and topoisomerase IV
b. RNA polymerase
c. Peptidoglycan synthesis
d. Protein synthesis

Q97 Which drug is a calcium channel blocker?

a. Nifedipine
b. Lisinopril
c. Metoprolol
d. Furosemide

Q98 A patient on chloroquine develops haemolytic anemia. Which type of patient is at risk?

a. G6PD-deficient individuals
b. Patients with diabetes
c. Elderly patients only
d. Patients with renal failure

Q99 Mannich reaction involves the condensation of:

a. An aldehyde, amine, and enolizable ketone
b. Two aldehydes and a ketone
c. Alcohol and carboxylic acid
d. Alkene and halide

Q100 Which vitamin is fat-soluble?

a. Vitamin B1
b. Vitamin C
c. Vitamin A
d. Vitamin B12

Correct Option is marked in RED

Q1 Which of the following cannot be conserved during Raman scattering?

a. Total Energy
b. Momentum
c. Kinetic Energy
d. Electronic Energy

Q2 The Raman spectrum is said to consist of Strokes lines when _____

a. $\Delta v > 0$
b. $\Delta v < 0$
c. $\Delta v = 0$
d. Does not depend on Δv

Q3 According to UGC regulation 2018 on Plagiarism, level 3 plagiarism refers to similarities

a. Above 60 %
b. Below 10 %
c. Above 10 % to 30 %
d. Above 40 % to 60 %

Q4 What is shielding in NMR?

a. Using a curved piece of metal to block an opponent's attack
b. Putting metal around an Rf source
c. When the magnetic moment of an atom blocks the full induced magnetic field from surrounding nuclei
d. Blocking parts of a molecule from Rf radiation

Q5 Which pump has similar principle as jet engine?

a. Diffusion pump
b. Rotary pump
c. Turbo molecular pump
d. None of the above

Q6 Which theory explains conventional superconductivity**?**

a. **BCS Theory**

b. Quantum Field Theory

c. Dirac Equation

d. Special Relativity

Q7 Who discovered the Raman Effect?

a. Albert Einstein

b. **C.V. Raman**

c. Max Planck

d. Niels Bohr

Q8 Ethical research requires:

a. Voluntary participation

b. Confidentiality of data

c. Honesty in data reporting

d. All of the above

Q9 What is one key advantage of SEM over Optical Microscopy?

a. **Higher depth of field and better resolution**

b. Lower magnification

c. Simpler sample preparation

d. Use of visible light for imaging

Q10 ……is a way to systematically solve the research problem

a. Technique

b. Research Methodology

c. Operation

d. Research Process

Q11 On what factors do the intensity of secondary electrons depend upon?

a. shape of the irradiated object

b. chemical composition of the irradiated object

c. number of electrons ejected

d. size and chemical composition of the irradiated object, number of electrons ejected and on the number of electrons reabsorbed by surrounding

Q12 What is the unit of molar absorptivity or absorptivity which is used to determine absorbance A in Beer Lambert's formula?

a. L mol^{-1} cm^{-1}

b. B. L gm^{-1} cm^{-1}

c. Cm

d. No unit

Q13 Which type of X-ray is commonly used in XRD analysis?

a. Gamma rays

b. Infrared rays

c. X-rays (Cu Kα radiation)

d. Ultraviolet rays

Q14 Which of the following pumping techniques is/are based on particle entrapment?

a. Diffusion pump

b. Rotary pump

c. Turbo molecular pump

d. None of the above

Q15 The angle between [111] and [11−2] directions in a cubic crystal is (in degrees)

a. 0

b. 45

c. 90

d. 180

Q16 The right to a patent belongs to:

a. Inventor

b. His heirs

c. His assigns

d. All of the above

Q17 The scientific method in research involves:

a. Speculation

b. Systematic observation, measurement, and experimentation

c. Personal judgment

d. Subjective analysis

Q18 Chemical vapour deposition is a method which is used to obtain which of the following substance?

a. Semiconductors

b. Non conducting polymers

c. Conducting compounds

d. Crystalline semiconductor

Q19 Which of the following is 1st order differential equation of degree 3 (third degree)

a. $\frac{d^3y}{dx^3} = 4x^2$

b. $\frac{dy}{dx} - \frac{d^2y}{dx^2} + y = 7x$

c. $\frac{dy}{dt} = t^2$

d. $\left(\frac{dy}{dx}\right)^3 + y = x$

Q20 Which of the following is an example of a thermoplastic polymer?

a. Bakelite

b. **Polyethylene**

c. Rubber

d. Epoxy resin

Q21 The general solution of the first order differential equation $\frac{dy}{dx} = ky$ is

a. $y = Ce^{kx}$

b. $y = kx + c$

c. $y = Cx^k$

d. $y = e^{-kx}$

Q22 What is the primary function of a goniometer in an XRD instrument?

a. Generates X-rays

b. **Measures angles between incident and diffracted X-rays**

c. Detects X-ray intensity

d. Increases resolution of diffraction peaks

Q23 What defines a high-temperature superconductor (HTSC)?

a. A superconductor operating at temperatures below 4.2 K

b. **A material that exhibits superconductivity above 77 K**

c. A metal with zero resistance at room temperature

d. A material with strong ferromagnetic properties

Q24 A numerical method to find values of the variable that make an algebraic equation equal to zero is

a. The Simpson Method

b. The Runge Kutta Method

c. The Euler method

d. The Newton Raphson Method

Q25 The Human Rights Day is observed on –

a. 10th December

b. 9th December

c. 1st December

d. None of the above

Q26 Good Research is always…….

a. Systematic

b. Fast

c. Narrow

d. Slow

Q27 Research ethics do not include

a. Honesty

b. Subjectivity

c. Integrity

d. Objectivity

Q28 Luminescence is because of

a. Knocking out of electrons by photons

b. Photons emitted while excited electrons drop down

c. Photons stimulated by photons

d. All of the above

Q29 What is the unit of absorbance which can be derived from Beer Lambert's law?

a. $L\ mol^{-1}\ cm^{-1}$

b. $L\ gm^{-1}\ cm^{-1}$

c. Cm

d. **No unit**

Q30 If the step size, h, is reduced in a numerical integration technique, the accuracy generally:

a. Increases

b. Decreases

c. Remains the same

d. Becomes zero

Q31 The symbol of the Maharaja of Air India represents

a. Copyright

b. Trademark

c. Patent

d. All of the above

Q32 The Runge-Kutta method is used for solving:

a. Algebraic equations

b. Ordinary differential equations (ODEs)

c. Partial differential equations (PDEs)

d. Integral equations

Q33 The "Citation Indexes" are now available online as

a. Web of Science

b. JCCC

c. Scopus

d. EBSCO

Q34 Main advantage of scanning probe microscope is

a. It can study surface morphology

b. It is not diffraction limited

c. It is dependent on weak forces

d. None of the above

Q35 Under which type of agreement royalty is paid on the basis of sale?

a. Mining

b. Patent

c. Copy right

d. Licensing

Q36 Crystallization is based on the:

a. Difference in melting point

b. Difference in solubility

c. Difference in boiling point

d. Difference in pressure

Q37 Which of the following is a key characteristic of biodegradable polymers?

a. They do not undergo degradation

b. They degrade through biological processes

c. They are always thermosetting

d. They are resistant to environmental degradation

Q38 Which of the following best defines a vacuum?

a. A space completely free of matter

b. **A space with pressure lower than atmospheric pressure**

c. A space with no atoms at all

d. A space filled with compressed gases

Q39 Beer Lambert's law gives the relation between which of the following?

a. Reflected radiation and concentration

b. Scattered radiation and concentration

c. Energy absorption and concentration

d. Energy absorption and reflected radiation

Q40 Which of the following is not an essential element of report writing?

a. Research Methodology

b. Reference

c. Conclusion

d. None of These

Q41 Vacuum is essential in which of the following applications?

a. Space simulations

b. Semiconductor manufacturing

c. Electron microscopy

d. **All of the above**

Q42 Raman spectroscopy is widely used in:

a. Chemical analysis

b. Semiconductor research

c. Pharmaceutical industry

d. **All of the above**

Q43 Intellectual Property Right (IPR) in India covers

a. Patents

b. Copyright

c. Trademarks

d. All the above

Q44 The University Grants Commission was constituted on the recommendation of which of the following?

a. Mudaliar Commission

b. Sargent Commission

c. Radha Krishnan Commission

d. Kothari Commission

Q45 Change in resistance of the heated wire is measured when it loses heat to the gas molecules in the gauge head. This is the basis of operation of which gauge.

a. Penning Gauge.

b. Hot Cathode Ionization Gauge

c. Pirani gauge

d. None of the above

Q46 What is a key challenge of photolithography as semiconductor feature sizes continue to shrink?

a. Insufficient light intensity

b. **Inability to form smaller patterns due to diffraction limits**

c. Inability to etch materials effectively

d. Limited photoresist material availability

Q47 AFM provides resolution at the:

a. Millimeter scale

b. Micrometer scale

c. **Nanometer or atomic scale**

d. Centimeter scale

Q48 Plagiarism can lead to

a. Retraction of your published paper

b. Suspension/termination from a job

c. Reject on of thesis

d. All of the above

Q49 What type of sample preparation is required for TEM?

a. **The sample must be thin (~50-100 nm) to allow electron transmission**

b. The sample must be conductive

c. The sample must be kept at room temperature

d. The sample must be coated with gold

Q50 Which type of light is commonly used in photolithography?

a. Infrared light

b. **Ultraviolet (UV) light**

c. X-rays

d. Visible light

Q51 The equation $u_{xx} + u_{yy} = u_{zz}$ is

a. Hyperbolic

b. Parabolic

c. Elliptic

d. none of these

Q52 The tight binding energy dispersion ($E-k$) relation for electrons in a one-dimensional array of atoms having lattice constant a and total length L

$$E = E_0 - \beta - 2\gamma\, cos(ka)$$

where E_0, β and γ are constants and k is the wave vector.

The effective mass of electrons in the band is given by

a. $\frac{\hbar^2}{\gamma a^2\, cos(ka)}$

b. $\frac{\hbar^2}{2\gamma a^2\, cos(ka)}$

c. $\frac{\hbar^2}{\gamma a^2\, sin(ka)}$

d. $\frac{\hbar^2}{2\gamma a^2 \sin(ka)}$

Q53 The electric potential due to a linear quadrupole varies inversely with

a. r

b. r^2

c. r^3

d. r^4

Q54 Which of the following crystal systems has two equal edge lengths and all angles 90°?

a. Triclinic

b. Tetragonal

c. Hexagonal

d. Rhombohedral

Q55 A BCC (Body-Centered Cubic) metal has an atomic radius of 0.12 nm. What is the lattice parameter of the unit cell?

a. 0.276 nm

b. 0.346 nm

c. 0.480 nm

d. 0.693 nm

Q56 Consider pure rotational spectrum of diatomic rigid rotor. The separation between two consecutive lines in the spectrum is

a. directly proportional to moment of inertia of rotor

b. inversely proportional to moment of inertia of rotor

c. depends on angular momentum of rotor

d. directly proportional to square of interatomic separation

Q57 The lowest energy of a quantum mechanical harmonic oscillator is ½ hv. It is referred to as

a. Ground state energy

b. Half point energy

c. **Zero-point energy**

d. All

Q58 Poisson's Brackets are the classical analogues of commutation relations between operators in:

a. Statistical mechanics

b. **Quantum Mechanics**

c. Relativistic Mechanics

d. Non-Relativistic Mechanics

Q59 Which of the following is a microprocessor

a. 8051

b. AVR

c. ARM

d. **8085**

Q60 If f(t) has a Fourier Transform F(ω), what is the Fourier Transform of f(t−2)

a. F(ω)

b. **$e^{-j2\omega}F(\omega)$**

c. $e^{j2\omega}F(\omega)$

d. 2F(ω)

Q61 In the Schrödinger equation for a particle, what does $\hat{H}$ represent?

a. **The energy of the particle.**

b. The momentum of the particle.

c. The Hamiltonian operator, which represents the total energy (kinetic + potential energy).

d. A constant coefficient

Q62 The Laplace equation can be written as

a. $\nabla^2 u = constant$

b. **$\nabla^2 u = 0$**

c. $\nabla u = constant$

d. $\nabla^2 u = f(x)$

Q63 In a MOSFET the drain current is a function of

a. Gate to source voltage

b. Pinch off Voltage

c. Both (a) and (b)

d. None of above

Q64 The energy band gap of GaAs, which is transparent to radiation of wavelength greater than 8700 Å, is approximately:

a. 1.42 eV

b. 1.1 eV

c. 0.67 eV

d. 2.0 Ev

Q65 The total energy, E of an ideal non-relativistic Fermi gas in three dimensions is given by

$$E \alpha \frac{N^{5/3}}{V^{2/3}}$$

where N is the number of particles and V is the volume of the gas. Identify the correct equation of state (P being the pressure),

a. $PV = \frac{1}{3}E$

b. $\boldsymbol{PV = \frac{2}{3}E}$

c. $PV = E$

d. $PV = \frac{5}{3}E$

Q66 The $\oint_c^{\cdot} tan\ z\ dz$, where c is |z| = 2 is:

a. 2л*i*

b. -2л*i*

c. 4л*i*

d. -4л*i*

Q67 To choose a suitable set of generalised coordinates in a given problem, we must take into account the following principles. Find the correct choice;

a. They specify the configuration of the system.

b. They must be varied arbitrarily and independently of each other, without violating the constraints of the system.

c. They must simplify mathematical calculation without affecting informative and enlightening system.

d. All of the above true

Q68 A classical gas of molecules, each of mass m, is in thermal equilibrium at the absolute temperature, T. The velocity components of the molecules along the Cartesian axes are v_x, v_y and v_z. The mean value of $(v_x+v_y)^2$ is

a. $\frac{k_B T}{m}$

b. $\frac{3k_B T}{2m}$

c. $\frac{k_B T}{2m}$

d. $\frac{2k_B T}{m}$

Q69 Which of the following is true about a particle in an infinite potential:

a. Its energies are such that $E_n \propto n$

b. It can have zero energy

c. Its energies are such that $E_n \propto n^2$

d. Its energies are continuous.

Q70 Two bodies of masses m and 2m are connected by spring constant, the frequency of normal mode is:

a. $\sqrt{\frac{3k}{2m}}$

b. $\sqrt{k/m}$

c. $\sqrt{2k/3m}$

d. $\sqrt{k/3m}$

Q71 For a particle in a potential well, the solutions to the time-independent Schrödinger equation are generally:

a. Sine or Cosine functions and time-dependent.

b. Non-periodic and time-independent.

c. Eigenfunctions that describe stationary states, each with a discrete energy eigenvalue.

d. constant functions.

Q72 The full form of a MESFET is

a. Metal Semiconductor Field effect transistor

b. Modified Silicon Field Effect Transistor

c. Metal Saturated field effect transistor

d. Metal silicon fused emission transistor

Q73 Raman lines on the low frequency side of the excitation frequency are called

a. Rayleigh

b. Stokes

c. Antistokes

d. None

Q74 What is the principal quantum number (n) in the hydrogen atom?

a. **It determines the energy level of the electron**

b. It determines the shape of the orbital

c. It determines the orientation of the orbital

d. It determines the spin of the electron

Q75 If the Hall coefficient (R_H) of a material is positive, what does this indicate about the material?

a. The material is a good conductor.

b. The material has more electrons than holes as charge carriers.

c. The material is a semiconductor.

d. **The material has more holes than electrons as charge carriers.**

Q76 A point charge q induces some charge on an infinite plane conducting surface when placed at a distance r from the plane which is also grounded, the charge induced on the surface:

a. q/r

b. q

c. -q

d. -q/r

Q77 Which is the correct derived wave equation based on Maxwell's equations in the vacuum? Where symbols have their usual meanings.

a. $\nabla^3 E = \mu_0 \varepsilon_0 \frac{\partial^3 E}{\partial t^3}$

b. $\nabla^3 E = \mu_0 \varepsilon_0 \frac{\partial^2 B}{\partial t^2}$

c. $\nabla^2 E = \mu_0 \varepsilon_0 c \frac{\partial^3 E}{\partial t^3}$

d. $\boldsymbol{\nabla^2 E = \mu_0 \varepsilon_0 \frac{\partial^2 E}{\partial t^2}}$

Q78 Which of the following is NOT a property of superconductors?

a. Zero electrical resistance

b. Perfect diamagnetism

c. Occurrence of Meissner effect

d. **Strong dependence on pressure for superconductivity**

Q79 The value of $\int_0^{1+i} z^2 \, dz \; along \; line \; x = y \; is$

a. $\frac{2}{3}$

b. $-\frac{2}{3}$

c. $-\frac{8i}{3}$

d. $\frac{8i}{3}$

Q80 The lowest energy state of the hydrogen atom corresponds to:

a. $n = 0$

b. $\boldsymbol{n = 1}$

c. $n = 2$

d. $n = \infty$

Q81 A vector A=6î + 5ĵ + 3k̂ makes an angle θx with the x-axis. The value of cos θx is:

a. **6/√49**

b. 6/√36

c. 6/√48

d. 6/√45

Q82 Which of the following factors increases the probability of quantum mechanical tunnelling?

a. Increasing the width of the barrier

b. Increasing the height of the barrier

c. **Decreasing the mass of the particle**

d. Increasing the mass of the particle

Q83 Find out the average power radiated by an oscillating electric dipole over a complete cycle in spherical coordinate system. Symbols have their usual meanings.

a. $\boldsymbol{\langle S \rangle = \left(\frac{\mu_0 p_0^2 \omega^4}{32\pi^2 c}\right)\frac{\sin^2\theta}{r^2}\hat{r}}$

b. $\langle S\rangle = \left(\frac{\mu_0 p_0^2 \omega^3}{32\pi^2 c}\right)\frac{\sin^2\theta}{r^2}\hat{r}$

c. $\langle S\rangle = \left(\frac{\mu_0 p_0^2 \omega^4}{32\pi^2 c}\right)\frac{\sin^2\theta}{r^3}\hat{r}$

d. $\langle S\rangle = \left(\frac{\mu_0 p_0^2 \omega^5}{32\pi^2 c}\right)\frac{\sin^2\theta}{r^2}\hat{r}$

Q84 Consider a system whose three energy levels are given by 0, ε and 2ε. The energy level ε is two-fold degenerate and the other two are non-degenerate. The partition function of the system with $\beta = \frac{1}{k_B T}$ is given by

a. $1 + 2e^{-\beta\varepsilon}$

b. $2e^{-\beta\varepsilon} + e^{-2\beta\varepsilon}$

c. $\mathbf{(1 + e^{-\beta\varepsilon})^2}$

d. $1 + e^{-\beta\varepsilon} + e^{-2\beta\varepsilon}$

Q85 The constraint on the motion of a particle in a plane reduces the number of degrees of freedom by:

a. Three

b. Four

c. **One**

d. None of these

Q86 The degeneracy of an excited state of nitrogen atom having electronic configuration $1s^2\ 2s^2\ 2p^2\ 3d^1$ is

a. 6

b. 10

c. 15

d. **150**

Q87 The circuit of a full adder consists of

a. AND, NOT and OR gate

b. XOR, NOT and AND gate

c. NOT and NAND gate

d. **AND, OR and XOR gate**

Q88 The wavelength range of visible light is 3800 A to 7600 A. The corresponding frequency range is

a. **$7.88X10^{14}$ to $3.94\ X10^{14}$**

b. $1.68X10^{14}$ to $3.94\ X10^{14}$

c. $7.88X10^{14}$ to $16.94\ X10^{14}$

d. $3.88X10^{14}$ to $8.94\ X10^{14}$

Q89 A copper block of mass 500 g is given 5000 J of heat, causing its temperature to rise from 25°C to 45°C. What is the specific heat capacity of copper?

a. **385 J/kg°C**

b. 410 J/kg°C

c. 500 J/kg°C

d. 420 J/kg°C

Q90 When a conductor having surface charge density σ is kept in constant electric field, the amount of outward electrostatic pressure on the surface is:

a. $P=(\varepsilon_0/4)E^2$

b. $P=(\varepsilon_0/2)E^2$

c. $P=(\varepsilon_0/4)E^3$

d. $P=(\varepsilon_0/6)E^4$

Q91 The coupling scheme most appropriate to heavy atoms is

a. ss coupling

b. sp coupling

c. **jj coupling**

d. ll coupling

Q92 The frequency of vibration of a bond is a function of

a. Force constant of the bond

b. Masses of atoms involved in bonding

c. Bond order

d. **Both A and B**

Q93 For an electrical circuit comprising an inductance L and capacitance C, charged to q coulomb and the current flowing in the circuit is i ampere, Lagrangian can be expressed as:

a. $L\dot{q}^2-q^2/C$

b. $L\dot{q}^2-q^2/2C$

c. $L\dot{q}^2-q^2/2C^2$

d. $\frac{1}{2}(L\dot{q}^2-\frac{q^2}{C})$

Q94 What is the potential inside a spherical shell of radius R which carries a uniform surface charge?

a. $\boldsymbol{V(r) = \frac{1}{4\pi\varepsilon_0}\frac{q}{R}}$

b. $V(r) = \frac{1}{4\pi\varepsilon_0}\frac{q^2}{R}$

c. $V(r) = \frac{1}{4\pi\varepsilon_0}\frac{q}{R^2}$

d. $V(r) = \frac{1}{4\pi\varepsilon_0}\frac{q^2}{R^3}$

Q95 The unit of the Hall coefficient is:

a. **m^3/C**

b. C/m^3

c. m^2/Vs

d. C/Vm

Q96 A FET is a

a. Current controlled device

b. **Voltage controlled device**

c. Both current as well as voltage controlled

d. None of these

Q97 For an inverting operational amplifier with Rf= 660 k Ω and R1= 3.3 k Ω the gain is

a. 10

b. 21

c. 100

d. **200**

Q98 What is the moment of inertia of a solid sphere having radius R and mass M about any axis of symmetry?

a. $I = \frac{4}{5}MR^2$

b. $\boldsymbol{I = \frac{2}{5}MR^2}$

c. $I = \frac{3}{4}MR^2$

d. $I = \frac{2}{5}MR$

Q99 The Hexadecimal equivalent of 65,535 is

a. FFEA

b. **FFFF**

c. F2D9

d. FFAC

Q100 The most fundamental logic gate with which any digital circuit can be easily made by repeated use is:

a. **NAND gate**

b. NOT gate

c. OR gate

d. None of these

Correct Option is marked in bold

Q1 The only solution of the system of linear equations

$2x + y + 3z = 13$

$x + y + z = 6$

$3x + y + z = 8$

is

a. $x=2, y=3, z=1$

b. $x=1, y=2, z=3$

c. $x=2, y=1, z=1$

d. $x=3, y=1, z=2$

Q2 The value of the parameter ‘a’ for which the system of linear equations

$(a+1)x + 8y = 4a$

$ax + (a+3)y = 3a-1$

has infinite number of solutions is:

a. 0

b. 1

c. -1

d. 5

Q3 The only value of the parameters ‘a’ for which the system of equations

$-4x + ay = 3+a$

$(6+a)x + 2y = 1+a$

has no solution is:

a. -4

b. 4

c. 6

d. -6

Q4 The only real value of λ for which the system of linear homogeneous equations

$(1- \lambda)x + 2y + 3z = 0$

$3x + (1- \lambda)y + 2z=0$

$2x + 3y + (1- \lambda)z = 0$

has a nonzero solution is:

a. 3

b. 6

c. 4

d. 1

Q5 The eigenvalues of the matrix $\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ are_____, where i= $\sqrt{-1}$

a. 1, 1

b. -1, -1

c. i, i

d. i, -i

Q6 The characteristic equation of the matrix

$$A=\begin{bmatrix} 5 & -1 & 3 \\ -6 & 4 & -6 \\ -6 & 2 & -4 \end{bmatrix},$$

is

a. $x^3 + 5x^2 + 8x - 4= 0$

b. $x^3 - 5x^2 + 8x - 4= 0$

c. $x^3 - 5x^2 + 8x - 4= 0$

d. $x^3 - 5x^2 - 8x + 4= 0$

Q7 The eigenvalues of the matrix A= $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ are

a. 1, 1

b. -1, 1

c. i, i

d. -1, -1

Q8 The matrix A = $\begin{bmatrix} 0 & 1 & 2 \\ 2 & -3 & 0 \\ 1 & 1 & -1 \end{bmatrix}$ satisfies the matrix equation

a. $A^3 + 4A^2 - A - 12\ I_3 = O_3$

b. $A^2 - 4A^2 - A - 12\ I_3 = O_3$

c. $A^3 + 4A^2 - A - 4\ I_3 = O_3$

d. $A^3 - 4\ A^2 - A + 4\ I_3 = O_3$

Where I_3 is a 3 X 3 identity matrix and O_3 is a 3 X 3 zero matrix

Q9 The values of x, y, z and t which satisfy the matrix equations

$$\begin{pmatrix} x+3 & 2y+x \\ z-3 & 4t-12 \end{pmatrix} = \begin{pmatrix} 0 & -7 \\ 1 & 4 \end{pmatrix}$$

are

a. x = −3, y= 5, z= 4, t= 4

b. x = −3, y= 5, z= 4, t= −4

c. x = −3, y= −2, z= 4, t= 4

d. x = −3, y= 5, z= −4, t= −4

Q10 Let A= $\begin{bmatrix} 1 & -1 & 1 \\ -3 & 2 & -1 \\ -2 & 1 & 0 \end{bmatrix}$, B = $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 1 & 2 & 3 \end{bmatrix}$. Then AB equals

a. I_3

b. O_3

c. $-I_3$

d. $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

Q11 $\begin{bmatrix} 1 & 1 & 1 \\ a^2 & b^2 & c^2 \\ a^3 & b^3 & c^3 \end{bmatrix}$ equals

a. (a – b) (b – c) (c – a) (a + b + c)

b. (a – b) (b – c) (c – a) $(\frac{1}{a} + \frac{1}{b} + \frac{1}{c})$

c. (a – b) (b – c) (c – a) (ab + bc + ca)

d. (a – b) (b – c) (c – a) (a – b – c)

Q12 If f(x)= x $\log_e x$ for all x > 0, then $\lim_{x \to 0^+} f(x)$equals

a. 0

b. $+\infty$

c. $-\infty$

d. e

Q13 If f: R → R is defined as

$$f(x) = \begin{cases} 1 \ if & x > 0 \\ 0 \ if & x = 0 \\ -1 \ if & x < 0 \end{cases},$$

then $\lim_{x \to 0} f(x)$

a. equals 0

b. equals 1

c. equals – 1

d. does not exist

Q14 The least value of the function $f(x) = x + \frac{a}{x},\ a > 0$, defined for all x ∈] 0, ∞ [, is

a. a

b. $\frac{1}{a}$

c. $2\sqrt{a}$

d. $\sqrt{a}$

Q15 The least value of the rational function

f (x) = $\frac{x^4 + x^2 + 4}{x}$, x ∈] 0, ∞ [, is

a. 1

b. 2

c. 4

d. 6

Q16 Let P (x) = x (x + 1) (x + 2) (x + 3), x ∈ R. The minimum value of P(x) is

a. 1

b. – 1

c. 6

d. 0

Q17 $\lim_{x \to 0} \frac{xe^{\frac{1}{x}}}{1 + e^{\frac{1}{x}}}$ equals

a. 0

b. 1

c. ∞

d. - ∞

Q18 The function f : R → R defines as

f (x) = $|x| + |x - 1|$

is

a. Continuous at x = 0 and discontinuous at x = 1,

b. Continuous at x = 0 and also continuous at x = 1,

c. Discontinuous at x = 0 and continuous at x = 1,

d. Discontinuous at x = 0 as well as x = 1,

Q19 If f(x) = (x – 1) (x – 2)^2, x ∈ [1, 2] and f' (c)= 0 for same c ∈] 1, 2[, then c equals

a. $\frac{4}{3}$

b. $\frac{5}{3}$

c. $\frac{6}{5}$

d. $\frac{7}{4}$

Q20 $\lim_{x\to+\infty}(\sqrt{x^2+3x}-x)$ equals

a. $\frac{1}{2}$

b. 1

c. $\frac{3}{2}$

d. 2

Q21 If f(x) = sin x and g(x) = cos x, x ∈ [$\frac{-\pi}{2}$, 0], and if

$$\frac{f(0)-f\left(\frac{-\pi}{2}\right)}{g(0)-g\left(\frac{-\pi}{2}\right)}=\frac{f'(c)}{g'(c)}$$

holds for some c ∈] $\frac{-\pi}{2}$, 0 [, then

a. $\frac{-3\pi}{4}$

b. $\frac{-\pi}{4}$

c. $\frac{-\pi}{8}$

d. $-\frac{\pi}{16}$

Q22 $\lim_{x\to-1}\frac{2x^2+x-1}{x^2-6x-7}$ equals

a. $\frac{1}{8}$

b. $\frac{2}{8}$

c. $\frac{3}{8}$

d. $\frac{4}{8}$

Q23 The only solution of the differential equation

$$\frac{dy}{dx}=e^y(e^x+x^2)$$

is

a. $e^x+e^y+\frac{1}{3}x^3=k$

b. $\boldsymbol{e^x + e^{-y} + \frac{1}{3}x^3 = k}$

c. $e^x + e^{-y} - \frac{1}{3}x^3 = k$

d. $e^x + e^y - \frac{1}{3}x^3 = k$

where k is an arbitrary real constant.

Q24 The only solution of the differential equation

$$\frac{dy}{dx} + \frac{2x^2 + 2xy}{x^2 + y^2} = 0$$

is

a. $\boldsymbol{2x^3 + 3yx^2 + y^3 = k}$

b. $2x^3 - 3yx^2 + y^3 = k$

c. $-2x^3 + 3yx^2 - y^3 = k$

d. $-2x^3 - 3yx^2 + y^3 = k,$

where k > 0 is an arbitrary real constant.

Q25 The only solution of the differential equation

$$\frac{dy}{dx} + \frac{4x}{x^2 + 1}\, y = \frac{1}{(x^2+1)^3}$$

is

a. $y\,(x^2 + 1) = tan^{-1}x + k$

b. $y\,(x^2 + 1)^3 = tan^{-1}x + k$

c. $\boldsymbol{y\,(x^2 + 1)^2 = tan^{-1}x + k}$

d. $y\,(x^2 + 1)^2 = x\,tan^{-1}x + k$

where k is an arbitrary real constant.

Q26 The only solution of the differential equation

$$\frac{dy}{dx} = \frac{1}{x+y+1}$$

is

a. $x + y + 1 = ke^y$

b. $\boldsymbol{x + y + 2 = ke^y}$

c. $x + y + 1 = ke^{-y}$

d. $x + y - 1 = ke^{-y}$

where k is an arbitrary real constant.

Q27 The only solution of the differential equation

$$\cos y \frac{dy}{dx} + \sin y \left(-\frac{2}{x}\right) = -\frac{1}{x^2}$$

is

a. $\sin y = \frac{1}{3x^3} + kx^2$

b. $\sin y = \frac{1}{3x^4} + kx^2$

c. $\mathbf{\sin y = \frac{1}{3x} + kx^2}$

d. $\sin y = \frac{1}{3x^2} + kx^2$

where k is an arbitrary real constant.

Q28 The combined solution of the differential equation

$$(\frac{dy}{dx})^3 + (2x - y)(\frac{dy}{dx})^2 - 2xy^2 \frac{dy}{dx} = 0$$

is

a. $\mathbf{(y - k)(y + x^2 - k)(xy + ky - 1) = 0}$

b. $(y - k)(y + x^2 - k)(x^2y + ky + 1) = 0$

c. $(y - k)(y + x^2 - k)(x^2y + ky + 2) = 0$

d. $(2y - k)(y + x^2 - k)(x^2y + ky + 2) = 0$

where k is an arbitrary real constant.

Q29 If

$$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5 = 0 \; and$$

y = 2 when x = 0

$$[\frac{dy}{dx}]_{x=0} = [\frac{d^2y}{dx^2}]_{x=0},$$

then

a. $y = 2e^{2x}(\text{Sin}\, x + Cos\, x)$

b. $y = 2e^{2x}(-\text{Sin}\, x + Cos\, x)$

c. $\mathbf{y = 2e^{-2x}(\text{Sin}\, x + Cos\, x)}$

d. $y = 2e^{-2x}(-\text{Sin}\, x + Cos\, x)$

Q30 The complete solution of the differential equation

$$9\frac{d^2y}{dx^2} + 12\frac{dy}{dx} + 4y = e^{-\frac{2}{3}x}$$

is

a. $(c_1 + c_2x)\, e^{-\frac{2}{3}x} + x^2 e^{-\frac{2}{3}x}$

b. $(c_1 + c_2x)\, e^{-\frac{2}{3}x} + \frac{x^2}{2} e^{-\frac{2}{3}x}$

c. $(c_1 + c_2x)\, e^{-\frac{2}{3}x} + \frac{x^2}{9} e^{-\frac{2}{3}x}$

d. $\boldsymbol{(c_1 + c_2x)\, e^{-\frac{2}{3}x} + \frac{x^2}{18} e^{-\frac{2}{3}x}}$

where $c_1$and $c_2$are arbitrary real constants.

Q31 The only solution of the homogeneous linear differential equation

$$x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} - 4y = 0$$

is

a. $y = c_1x^2 + \frac{c_2}{x}$

b. $\boldsymbol{y = c_1x^2 + \frac{c_2}{x^2}}$

c. $y = c_1x^2 + \frac{c_2}{x^3}$

d. $y_1 = c_1x^2 + c_2x$

Q32 The general solution of the simultaneous ordinary differential equations

$$\frac{dx}{z-y} = \frac{dy}{x-z} = \frac{dz}{y-x}$$

is

a. $\boldsymbol{x + y + z = c_1, \quad x^2 + y^2 + z^2 = c_2}$

b. $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = c_1, \quad x^2 + y^2 + z^2 = c_2$

c. $x + y + z = c_1, \quad \frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = c_2$

d. $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = c_1, \frac{1}{x^2} + \frac{1}{y^2} + \frac{1}{z^2} = c_2$

where $c_1$and c_2 are arbitrary real constants.

Q33 The general solution of the partial differential equation

$z\,(xp - yq) = y^2 - x^2$,

where p = $\frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$, is

a. $xy = c_1,\ x + y + z = c_2$

b. $\boldsymbol{xy = c_1, x^2 + y^2 + z^2 = c_2}$

c. $xy^2 = c_1,\ x^2 + y^2 + z^2 = c_2$

d. $x^2y = c_1,\ x - y - z = c_2$

where c_1 and c_2 are arbitrary real constants.

Q34 The complete integral of the partial differential equation

Z = pq, where p = $\frac{\partial z}{\partial x}$, $q = \frac{\partial z}{\partial y}$, is

a. $\boldsymbol{z = (y + c_2)\,(x + c_1)}$

b. $z = (c_2 y)\,(c_1 x)$

c. $z = (y + c_2)\,(c_1 x)$

d. $z = (c_2 y)\,(x + c_1)$

where $c_1$and c_2 are arbitrary real constants.

Q35 The complete solution of the differential equation

$\frac{\partial^3 z}{\partial x^3} - 5\,\frac{\partial z}{\partial x \partial y} + 6\,\frac{\partial^3 z}{\partial y^2} = e^{x+y}$

is

a. $z = f_1(y + 2x) + f_2(y + 3x) + \frac{1}{12}e^{x+y}$

b. $z = f_1(y + 2x) + f_2(y + 3x) + \frac{1}{10}e^{x+y}$

c. $\boldsymbol{z = f_1(y + 2x) + f_2(y + 3x) + \frac{1}{2}e^{x+y}}$

d. $z = f_1(y + 2x) + f_2(y + 3x) + \frac{1}{6}e^{x+y}$

Q36 The complete solution of the differential equation

$\frac{\partial^3 z}{\partial x^3} - 4\,\frac{\partial^3 z}{\partial x^2 \partial y} + 4\,\frac{\partial^3 z}{\partial x \partial y^2} = 2\,Sin\,(3x + 2y)$

is

a. $z = f_1(y) + f_2(y + 2x) + x f_3(y + 2x) + \frac{1}{3}\,Cos\,(3x + 2y)$

b. $\boldsymbol{z = f_1(y) + f_2(y + 2x) + x f_3(y + 2x) + \frac{2}{3}\,Cos\,(3x + 2y)}$

c. $z = f_1(y) + f_2(y + 2x) + x f_3(y + 2x) + \frac{1}{3}\,Sin\,(3x + 2y)$

d. $z = f_1(y) + f_2(y + 2x) + x f_3(y + 2x) + \frac{2}{3}\,Sin\,(3x + 2y)$

Q37 If $u = Sin^{-1}\left(\frac{x}{y}\right) + tan^{-1}\left(\frac{y}{x}\right)$, then

a. $x\frac{\partial u}{\partial x} + y\,\frac{\partial u}{\partial y} = 1$

b. $x\frac{\partial u}{\partial x} + y\,\frac{\partial u}{\partial y} = 2$

c. $x\frac{\partial u}{\partial x} + y\,\frac{\partial u}{\partial y} = 3$

d. $\boldsymbol{x\frac{\partial u}{\partial x} + y\,\frac{\partial u}{\partial y} = 0}$

Q38 The only solution of the differential equation

$$\frac{\partial u}{\partial x} = 2\,\frac{\partial u}{\partial t} + u$$

Subject to the condition

$$u\,(x, 0) = 6\,e^{-3x}$$

is

a. $u = 6\,e^{-2x-3t}$

b. $\boldsymbol{u = 6\,e^{-3x-2t}}$

c. $u = 6\,e^{2x+3t}$

d. $u = 6\,e^{3x+2t}$

Q39 The differential equation of which $y = e^{x}(A\,Cos\,x + B\,Sin\,x)$ is a solution is

a. $\boldsymbol{\frac{d^2y}{dx^2} - 2\,\frac{dy}{dx} + 2y = 0}$

b. $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = 0$

c. $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 2y = 0$

d. $\frac{d^2y}{dx^2} - \frac{dy}{dx} + 2y = 0$

Q40 The only nonzero value of m for which the function $V = V\,(x, y, z) = (x^2 + y^2 + z^2)^{\frac{m}{2}}$ satisfies the Laplace equation

$$\frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} + \frac{\partial^2 V}{\partial z^2} = 0$$

is

a. **m = -1**

b. m = 1

c. m = -2

d. m = 2

Q41 The weighted average mean of the first n natural numbers, the weight being equal to the corresponding numbers, is

a. $\boldsymbol{\frac{2n+1}{3}}$

b. $\frac{(n+1)\,(2n+1)}{6}$

c. $\frac{n\,(n+1)}{6}$

d. $\frac{2n+1}{6}$

Q42 A student obtained mean= 40 of 100 observations. It was discovered later that he had wrongly copied down one observation as 50 instead of 40. The correct mean is.

a. 35.9

b. 39.9

c. 37.9

d. 38.9

Q43 Give the numbers 10, 11, 12, 15, 18, 22, 8, 10, 12, 15, 25; the median is:

a. 10

b. 12

c. 15

d. 18

Q44 A student obtained 16 as the geometric mean of 10 observations. It was discovered later on that he misread 12 as 21. The correct geometric mean is

a. $\mathbf{16\ (\frac{7}{4})^{\frac{1}{10}}}$

b. $18\ \left(\frac{7}{4}\right)^{\frac{1}{10}}$

c. $21(\frac{7}{4})^{\frac{1}{10}}$

d. $12\ (\frac{7}{4})^{\frac{1}{10}}$

Q45 Variance of the series

a, a + d, ----------, a + 2 n d

is

a. $n\ (n+1)d^2$

b. $\frac{n\ (n+1)}{2}d^2$

c. $\frac{\boldsymbol{n\ (n+1)}}{\mathbf{3}}\boldsymbol{d^2}$

d. $\frac{n(n+1)}{4}d^2$

Q46 10 dice are thrown 300 times. The appearances of an odd number on a dice is considered as a success. The standard error (upto decimal places) of the number of successes is

a. 27.155

b. 27.352

c. 27.372

d. 27.385

Q47 A random sample of 500 mangoes, taken from a large consignment, contained 65 bad mangoes. The percentage of bad mangoes is the consignment lies between

a. 8.5% and 13%

b. 8.5% and 15%

c. 8.5 % and 17.5%

d. 8.5% and 20%

Q48 A sample of 900 members has the sample mean 3.4 cm. Suppose this sample has been drawn from a normal population with mean 3.25 cm and standard deviation 2.61 cm. The 95% financial limits of the sample mean are:

a. 3.5700 and 3.2295

b. 3.5705 and 3.2230

c. 3.5705 and 3.2295

d. 3.5705 and 3.2295

Q49 The method of maximum likelihood provides estimates which are

a. **Consistent, efficient and sufficient**

b. Consistent, efficient but sufficient

c. Consistent, sufficient but not efficient

d. Efficient, sufficient but not consistent

Q50 Suppose a sample of size n is drawn by random sampling for a normal population with mean μ and variance σ^2. Then

a. The sample mean $\bar{x}$is a sufficient estimator for μ, if the variance σ^2 of the population is known

b. $S^2 = \frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2$ is a sufficient estimator for σ^2 if the population mean μ is known

c. $S^2 = \frac{1}{n}\sum_{i=1}^{n}((x_i - \bar{\mu})^2)$ is not a sufficient estimator for the population variance σ^2.

d. None of the above

Q51 Above 1 GHz, which of these statements holds true?

a. Propagation time is comparable with time period

b. Wavelength is comparable with circuit length

c. Distributed circuit elements are used

d. All of these

Q52 In a lossless transmission line with matched generator and load, the SWR and reflection coefficient are

a. **Unequal in magnitude**

b. Both equal to 1

c. Both equal to ∞A

d. both equal to 0

Q53 The circles drawn in a smith Chart shown in Fig.1, represents

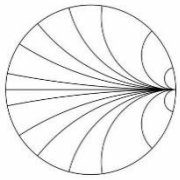


Fig.1

a. Unit circles

b. Constant resistance circle

c. **Constant reactance circle**

d. Constant reflection coefficient circle

Q54 A person with receiver is 15Km away from the transmitter. What is the distance that this person must move further to detect a 3dB decrease in signal strength

a. **6213 m**

b. 2570 m

c. 4978 m

d. 5320 m

Q55 For static and magnetic fields in an inhomogeneous source free medium, which of the following the correct form of Maxwell's equation?

a. $\nabla . E = 0, \quad \nabla \times B = 0$

b. $\nabla . E = 0, \quad \nabla . \mathrm{B} = 0$

c. $\nabla \times E = 0, \ \nabla \times B = 0$

d. $\boldsymbol{\nabla \times E = 0, \quad \nabla . B = 0}$

Q56 Which of the following modes is not possible in a circular waveguide?

a. $\mathbf{TE_{10}}$

b. TE_{01}

c. TE_{11}

d. TE_{12}

Q57 A dipole antenna is a

a. Conduction current antenna

b. Displacement current antenna

c. includes both displacement and conduction current

d. none of these

Q58 A non-zero Doppler shift represents

a. A static target

b. A target moving towards the RADAR

c. A target moving away from the RADAR

d. Either (b) or (c)

Q59 One of the following is *not* a useful quantity for comparing the noise performance of receivers

a. **Input noise voltage**

b. Equivalent noise resistance

c. Noise temperature

d. Noise figure

Q60 The modulation index of an AM wave is changed from 0 to 1. The transmitted power is

a. Unchanged

b. Halved

c. Doubled

d. **increase by 50 percent**

Q61 One of the following *cannot* be used to remove the unwanted sideband in SSB. This is the

a. filter system

b. phase-shift method

c. third method

d. **balanced modulator**

Q62 A pre-emphasis circuit provides extra noise immunity by

a. boosting the bass frequencies

b. **amplifying the higher audio frequencies**

c. pre amplifying the whole audio band

d. converting the phase modulation to FM

Q63 Indicate the *false* statement in connection with communications receivers.

a. The noise limiter cuts off the receiver's output during a noise pulse.

b. A product demodulator could be used for the reception of Morse code.

c. Double conversion is used to improve image rejection

d. **Variable sensitivity is used to eliminate selective fading**

Q64 Time-division multiplex

a. can be used with PCM only

b. combines five groups into a supergroup

c. stacks 24 channels in adjacent frequency slots

d. interleaves pulses belonging to different transmissions

Q65 Quadrature multiplexing is

a. same as FDM

b. same as TDM

c. combination of FDM and TDM

d. the scheme where the same carrier frequency is used for two different signals

Q66 In a PCM system each quantization level is encoded into 8 bits. The signal-toquantization noise ratio is equal to

a. 24 dB

b. 48 dB

c. 64 dB

d. 256 dB

Q67 The capacity of Gaussian channel is

a. C = 2B(1+S/N) bits/s

b. $C = B^2(1+S/N)$ bits/s

c. C = B(1+S/N) bits/s

d. C = B(1+S/N)2 bits/s

Q68 The relation between entropy and mutual information is

a. **I(X;Y) = H(X) - H(X/Y)**

b. I(X;Y) = H(X/Y) - H(Y/X)

c. I(X;Y) = H(X) - H(Y)

d. $I(X;Y) = H(Y) - H(X)$

Q69 If S(f) is the power spectral density of a real, wide-sense stationary random process, then which of the following is always true?

a. $S(0) \leq S(f)$

b. $S(f) \geq 0$

c. $S(-f) = -S(f)$

d. $\int_{-\infty}^{\infty} s(f)df = 0$

Q70 A low pass filter having a frequency response $H(j\omega) = A(\omega)\, e^{j\phi(\omega)}$ does not produce any phase distortion if

a. $A(\omega) = C\omega^2, \phi(\omega) = k\omega^2$

b. $A(\omega) = C\omega^2, \phi(\omega) = k\omega$

c. $A(\omega) = C\omega, \ \phi(\omega) = k\omega^2$

d. $A(\omega) = C, \phi(\omega) = k\omega^{-1}$

Q71 Which of the following statements is correct for any closed loop system?

a. Only one of the static error co-efficient has a finite non-zero value

b. All the co-efficient can have zero value

c. All the co-efficient are always non-zero

d. All of the mentioned

Q72 The step error coefficient of a system G(s) = 1/ (s+2)(s+3) with unity feedback is:

a. 0

b. Infinite

c. 1

d. 1/6

Q73 Calculate the poles and zeroes for the given transfer function $G(s) = \frac{5\,(s+2)}{(s2+3s+2)}$

a. -2, (-1, -2)

b. 2, (-1, 2)

c. 2, (1, 2)

d. -2, (1, -2)

Q74 The corner frequency in the Bode plot is:

a. The frequency at which bode plot slope is 0 dB /decade.

b. The frequency at which bode plot slope is -10 dB /decade.

c. The frequency at which the two asymptotes intersect.

d. The frequency at which the two asymptotes meet.

Q75 The signal flow graph shown in the Fig.2 has:

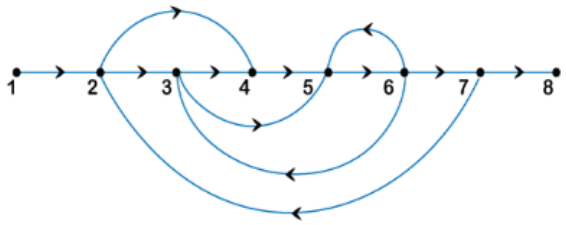


Fig.2

a. forward path = 2, loops = 4, and non-touching loops = 0

b. forward path = 3, loops = 4, and non-touching loops = 0

c. forward path = 3, loops = 3, and non-touching loops = 0

d. forward path = 2, loops = 4, and non-touching loops = 2

Q76 A transistor has a current gain of 0.99 in the CB mode. Its current gain in the CC mode is

a. 100

b. 99

c. 1.01

d. 0.99

Q77 An LED has a rating of 2 V and 10 mA. It is used along with 6V battery. The range of series resistance is

a. 0 to 200 Ω

b. 200 - 400 Ω

c. 200 Ω and above

d. 400 Ω and above

Q78 Which of the following equation represents mass action law for semiconductors in electronic circuits?

a. $n \times p = n_i^2$

b. $n \times p = n_i$

c. $n \times p = n_i^3$

d. $n \times p = n_i^{1/2}$

Q79 If the input frequency of a half wave rectifier is 100Hz, then the ripple frequency will be

a. 150Hz

b. 200Hz

c. 100Hz

d. 300Hz

Q80 The ideal values for the input resistance (Ri) and the output resistance (Ro) of a transconductance amplifier are

a. $R_i = 0$ and $R_o = 0$

b. **$R_i = \infty$ and $R_0 = \infty$**

c. $R_i = 0$ and $R_0 = \infty$

d. $R_i = \infty$ and $R_i = 0$

Q81 The total gain of a multistage amplifier is less than the product of the gains of individual stages due to

a. Power loss in the coupling device

b. Loading effect of the next stage

c. The use of many transistors

d. The use of many capacitors

Q82 A n-channel D-MOSFET with a positive V_{GS} is operating in

a. the depletion-mode

b. the enhancement-mode

c. cut off

d. saturation

Q83 Suppose the output of an XNOR gate is 1. Which of the given input combination is correct?

a. A = 0, B' = 1

b. A = 1, B = 1

c. A = 0, B = 1

d. A = 0, B = 0

Q84 The bit capacity of a memory that has 2048 addresses and can store 8 bits at each address is

a. 4096

b. 16384

c. 32768

d. 8129

Q85 The status flag that is available in microprocessor 8085, but not available in micro-controller 8051 is:

a. Carry flag

b. Overflow flag

c. Auxiliary flag

d. Zero flag

Q86 The output of a particular Op-amp increases 8V in 12μs. The slew rate is …….

a. 90 V/μs

b. 0.67 V/μs

c. 1.5 V/μs

d. none of these

Q87 The circuit shown in Fig.3 is based on ideal operational amplifier. It acts as a

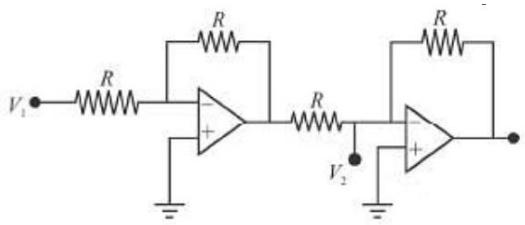


Fig.3

a. Subtractor

b. Adder

c. Buffer amplifier

d. Divider

Q88 Power Consumption of CMOS circuits depend on

a. Switching frequency

b. load capacitance

c. Supply voltages

d. All

Q89 For the circuit shown in Fig.4, the equivalent resistance will be

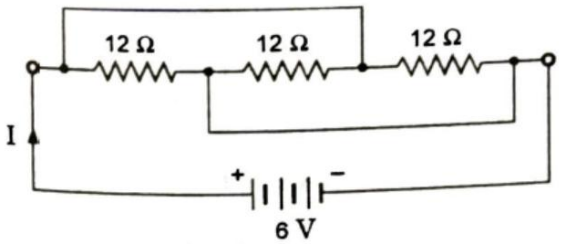


Fig.4

a. 36Ω

b. 12Ω

c. 4Ω

d. 6Ω

Q90 Three equal resistances are connected in the star. If this star is converted into an equivalent delta

a. The resistance of both the networks will be equal

b. the resistances of the delta network will be smaller than those of star network

c. the resistances of the delta network will be larger than those of star network

d. none of the above

Q91 Where does the maximum value of auto-correlation function of a power signal occur?

a. At origin

b. At extremities

c. At unity

d. At infinity

Q92 Where is the ROC defined or specified for the signals containing causal as well as anti-causal terms?

a. Greater than the largest pole

b. Less than the smallest pole

c. Between two poles

d. Cannot be defined

Q93 What is the nature of Fourier representation of a discrete & aperiodic signal?

a. Continuous & periodic

b. Discrete & aperiodic

c. Continuous & aperiodic

d. Discrete & periodic

Q94 In the frequency response characteristics of FIR filter, the number of bits per coefficient should be _____in order to maintain the same error.

a. Increased

b. Constant

c. Decreased

d. None of the above

Q95 A signal x[n] is anti-symmetric or odd when

a. $x[-n] = x[n] \bullet x[n]$

b. $x[n] = -x[n]$

c. $x[n] = [x[n]]^2$

d. **x[-n] = -x[n]**

Q96 In a pure inductive circuit if the supply frequency is reduced to $1/10^{th}$ of the previous value, the current will be:

a. the same

b. ten times high

c. reduced to one tenth

d. None of the above

Q97 The Q factor of a parallel resonant circuit is given by

a. $\frac{1}{R}\sqrt{\frac{L}{C}}$

b. $\boldsymbol{R\sqrt{\frac{C}{L}}}$

c. $\frac{1}{R}\sqrt{\frac{1}{LC}}$

d. $\frac{R}{\sqrt{LC}}$

Q98 The z-transform of the impulse response y(n) = x(n) + 2x(n - 1) is:

a. $\mathbf{1 + 2z^{-1}}$

b. $1 + 2z^2$

c. 1 - 2z

d. 1/2z

Q99 A series of equal space time pulses may be easily generated by which type of counter circuit?

a. Johnson shift

b. Clock shift

c. Binary shift

d. Ring counter

Q100 Which of the following statement is correct about Butterworth filters?

1. The magnitude response of the Butterworth filter has ripples in the pass-band.
2. Its pole lies on a circle in the s-plane.
3. Its design requires fewer parameters.
4. Its pole lies on an ellipse in the s-plane.

a. 1 and 3

b. 2 and 3

c. 1 and 4

d. 1, 2, and 4

Correct Option is marked in bold

1. Which of the following is not one of the major research philosophies used in research?
    a. Positivism
    b. Interpretivism
    c. **Prioritism**
    d. Realism

2. Which of the following is not a continuous variable?
    a. Height
    b. **Gender**
    c. Annual Income
    d. Age

3. Using deduction, theory is developed at _____ level in research
    a. **Concept**
    b. Empirical
    c. Both of the above
    d. None of the above

4. Which of the following is not a descriptive hypothesis?
    a. Flood-prone areas reported high water levels this monsoon
    b. Number of relief camps increased after cyclone
    c. 30% of villages have early warning systems
    d. **Evacuation success decreases with increase in population density**

5. Which of the following is not a quality of research
    a. Comprehensive
    b. **Ambiguous**
    c. Ethical
    d. Justified conclusions

6. Which of the following is not true for quasi-experimental studies?
    a. **The researcher can schedule the experiments or assign subjects to the experiments randomly**
    b. The researcher may not have control of extraneous variables and the experiments
    c. The stimulus can occur only in the natural environment
    d. Time series design is a commonly used design

7. Which of the following is not true about research design in research project?
    a. Research design is a framework for conducting the research project.
    b. Research design specifies the measurement and scaling procedures
    c. **Research design is undertaken before developing the approach to the problem**
    d. Research design is undertaken after the research problem is defined

8. _____ is conducted on a one-on-one basis to find out the thoughts, beliefs, attitudes and feelings of a respondent.
    a. Focus group
    b. Projective technique
    c. **In-depth interview**
    d. None of the above

9. _____ is a data collection technique in which structured and direct questioning is done to the respondent using a questionnaire
    a. **Survey**
    b. Focus Group interview
    c. Group discussion
    d. Experiment

10. _____ is the process of creating and analyzing a prototype of a disaster evacuation model to predict its performance in the real emergencies
    a. Heuristic modeling
    b. **Simulation modeling**
    c. Experimental modeling
    d. Verbal models

11. _____ is the generation of a continuum upon which response teams are located based on effectiveness scores
    a. Ranking
    b. Measurement
    c. **Scaling**
    d. Rating

12. The rankings of disaster response teams by recovery speed constitute a _____ scale.
    a. Nominal
    b. **Ordinal**
    c. Interval
    d. Ratio

13. _____ is the degree to which the measurement scale accurately captures and reflects the actual differences among the objects that the researcher is attempting to measure
    a. **Validity**
    b. Reliability
    c. Generalizability
    d. Sensitivity

14. _____ is not an example of internal data sources in research
    a. Sales data
    b. **Government report**
    c. Financial data
    d. Storage data

15. The mistake when using secondary data effectively is _____
    a. to combine it with other data
    b. **to assume it is right**
    c. to locate it via people
    d. to evaluate its usefulness

16. Which of the following is not true about primary data?
    a. It is collected afresh and for the first time
    b. It is original in character
    c. **The data collection costs are always very low**

d. The data is collected with research objectives in mind

17. Which of the following is not true about case study design?
    a. The boundary between the case and its context in both spatial and chronological dimensions may be blurred
    b. The case study design begins with arriving at a tentative case definition
    c. **Researchers always have to redefine the case before collecting initial data**
    d. Generally, to select a case study, a remarkable event is studied which has distinct features

18. In situations where not all respondents are sufficiently informed to answer a question:
    a. **Filter questions should be used**
    b. Multiple questionnaires should be designed
    c. Open-ended questions should be used
    d. Double-barreled questions should be used

19. What is the advantage of open-ended questions?
    a. Can be analyzed slowly
    b. **Can explore new areas**
    c. Can be asked slowly
    d. Can be misinterpreted

20. "Do you think the strength and speed of the flood warning system is adequate and easy to understand?", is an example of a _____
    a. Structured question
    b. Dichotomous question
    c. **Double-barreled question**
    d. Branching question

21. A _____ is the aggregate of all the members of a defined group that is being studied
    a. Demography
    b. **Population**
    c. Census
    d. Element

22. When studying large populations, it is recommended that researchers should not even try to use the entire population in their research because _____
    a. One can easily define clearly who makes up the entire population
    b. **Studying the population also can be too costly in terms of human resources and other expenses**
    c. Both a and b
    d. None of the above

23. Which of the following is not a probability sampling technique?
    a. Simple random sampling
    b. Stratified sampling
    c. Systematic sampling
    d. **Quota sampling**

24. The sample size decision should be guided by certain qualitative considerations. Which of the following is not one of those considerations?
    a. The resource constraints
    b. The average size of samples in similar studies
    c. The sampling technique to be used

d. **The nature of the analysis**

25. Which of the following is not a step in the data preparation process?
    a. Editing
    b. **Analysis**
    c. Transcribing
    d. Data cleaning

26. _____ involves checking and correcting the inaccurate and incomplete responses.
    a. **Data cleaning**
    b. Editing
    c. Coding
    d. Questionnaire checking

27. _____ is calculated to study the variation of data from its center as well as the overall range spread of the data
    a. Measure of deviation
    b. **Measure of variability**
    c. Measure of shape
    d. Measure of skewness

28. Which of the following is not a measurement of variability?
    a. Range
    b. Variance
    c. Deviation
    d. **Mode**

29. Which of the following is not true for normal distribution?
    a. Mean = Median
    b. Kurtosis = 3
    c. Skewness = 0
    d. **Mode > Median**

30. The _____ is the most appropriate measure of central tendency for interval or ratio data
    a. **Mean**
    b. Median
    c. Mode
    d. Range

31. The alternative hypothesis: the percentage of households using emergency kits is 0.40, is a _____
    a. Type I error
    b. **Two-tailed test**
    c. Type II error
    d. One-tailed test

32. The probability of correctly rejecting a false null hypothesis is called _____
    a. Level of significance
    b. Type I error
    c. **Power**
    d. Type II error

33. The type I error and type II error are _____
    a. not related to each other
    b. **inversely related to each other**
    c. directly proportional to each other
    d. similar type of errors

34. Parametric tests can be applied only if the data is measured using at least _____
    a. **Interval scale**
    b. Ratio scale
    c. Ordinal scale
    d. Nominal scale

35. The nonparametric tests that can be used for hypothesis testing of paired samples are
    a. **Chi-square test**
    b. Mann-Whitney U test
    c. t test
    d. K-S test

36. A statistical technique for examining the differences among means for two or more populations is called _____
    a. Chi-square
    b. Cross-tabulation
    c. **ANOVA**
    d. Independent samples t test

37. The null hypothesis for ANOVA typically is that all _____
    a. Proportions are equal
    b. **Means are equal**
    c. Proportions are unequal
    d. Means are unequal

38. In one-way ANOVA, _____ involves decomposing SSy into two components using the equation $SS_y = SS_{between} + SS_{within}$?
    a. deasure the strength of effects
    b. **decomposition of the total variation**
    c. hypothesis testing
    d. defining dependent variable

39. How disaster survivors' recovery satisfaction varies with relief amount and counseling sessions is best analyzed using _____
    a. **n-way ANOVA**
    b. One-way ANOVA
    c. ANCOVA
    d. Regression

40. _____ means the determining if there is a relationship between two sets of data or observations
    a. **Correlation**
    b. Regression
    c. ANOVA
    d. Variance

41. The value of correlation coefficient varies between _____
    a. **-1 and 1**
    b. 0 and 1
    c. -1 and 0
    d. -100 and 100

42. _____is used to predict an unknown dependent variable using known independent variable/s
    a. Correlation
    b. **Regression**
    c. ANOVA
    d. Variance

43. In bivariate regression analysis has _____
    a. Two dependent variables and one independent variable
    b. One dependent variable and two independent variables
    c. **One dependent variable and one independent variable**
    d. Two dependent variables and two independent variables

44. Report formats are not likely to vary based on:
    a. The research agency conducting the disaster study
    b. The government agency funding the project
    c. The nature of the disaster research project
    d. **The client's method of payment**

45. Objectivity is the essence that should steer report writing. It means:
    a. **Tell it like it is**
    b. Tell it like it should be
    c. Tell it like it can be
    d. Tell it like you wanted it to be

46. Longitudinal and cross-sectional research are research classifications based on _____
    a. **Time periods of data collection**
    b. scope of objectives
    c. type of data collected
    d. analysis techniques

47. Which of the following is not a nonparametric test that can be used for single sample?
    a. Chi-square test
    b. Kolmogorov-smirnov (K-S)
    c. **z test**
    d. Binomial tests

48. Which of the following in not characteristics of a good research?
    a. Objectivity
    b. Transparency
    c. Ethical
    d. **Euphoric**

49. Which of the following is not a type of research design?
    a. Exploratory
    b. Descriptive
    c. Experimental
    d. **Critical**

50. A statement that can be judged as true or false is termed as
    a. **Proposition**
    b. Hypotheses
    c. Assumption
    d. Suggestion

51. In 2024, Wayanad disaster in India was caused by
    a. Volcanic Eruption
    b. **Landslide**
    c. Low Temperature
    d. Gas Leak

52. Who among the following is generally be the early responders when a disaster strikes?
    a. Non-Governmental Organizations
    b. **Local administration**
    c. Philanthropists
    d. International Relief Organizations

53. Disaster management plan was launched by ministry of home affair in
    a. 2005
    b. 2011
    c. **2016**
    d. 2020

54. Which of the following is NOT a phase of emergency management?
    a. **Recourse**
    b. Mitigation
    c. Response
    d. Recovery

55. Which one of the following ministries is the nodal ministry at the centre for coordinating disaster management activities for all the natural disasters except drought?
    a. Ministry of Agriculture
    b. **Ministry of Home Affairs**
    c. Ministry of Defence
    d. Ministry of Health and Family Welfare

56. In which year national disaster management act was implemented in India?
    a. 2003
    b. 2004
    c. **2005**
    d. 2006

57. Which method is widely used to measure flood variability?
    a. FFI
    b. **FFA**
    c. FI
    d. FMI

58. To detect Tsunami along the coast, coastal tide gauges are placed _____ km away?
    a. **50**
    b. 150
    c. 200
    d. 250

59. International Day of Natural Disaster Reduction is celebrated on?
    a. June 15
    b. March 5
    c. **October 13**
    d. September 13

60. International Tsunami Information Center is located at _____
    a. **Honolulu**
    b. Hyderabad
    c. Goa
    d. Pondicherry

61. Select the correct full form of ISDR?
    a. International Sustainable Development Report
    b. **International Strategy for Disaster Recovery**
    c. International Significant Disaster Resources
    d. Intergovernmental Strategy for Disaster Response

62. What of the following device/s is/are used to track minute changes in volcanoes' ground slope and shape?
    a. Strain meters
    b. Tiltmeter
    c. **Both a and b**
    d. Only a Not b

63. According to the Indian Meteorological Department (IMD) classification of Cyclones, which of the following is true about Severe Cyclonic Storm?
    a. wind speed is above 221 km/hr
    b. **wind speed is 89-117 km/hr**
    c. wind speed is above 166-220 km/hr
    d. wind speed is above 118-165 km/hr

64. The scientific study of earthquake is called?
    a. Seismograph
    b. **Seismology**
    c. Both a and b
    d. None of the above

65. What is the name of the instrument used for measuring earthquake intensity?
    a. **Modified Mercalli Scale**
    b. Metrological Scale
    c. Vernier Scale
    d. Barometer

66. The flood prone area in India is about_____ of its total area.
    a. 21%
    b. 18%
    c. **12%**
    d. 9%

67. In disaster management, mitigation measures involve
    a. Governmental action and administration
    b. **Community action and administration**
    c. Military action and administration
    d. Social action and administration

68. Who is the ex-officio chairman of NDMA
    a. Home Secretary
    b. **Prime Minister of India**
    c. President of India
    d. Vice-President of India

69. Which is the most landslide prone area in India
    a. Yamuna region
    b. South India Plateau
    c. **Himalaya and north eastern hill**
    d. Coastal Region

70. In India Tsunami Warning Centre is located at
    a. Kolkata
    b. **Hyderabad**
    c. Delhi
    d. Mumbai

71. In India, Cyclone is tracked through which satellite?
    a. **INSAT**
    b. IRS
    c. Ocean SAT
    d. IRSAT

72. The Bhopal Gas disaster occurred on
    a. December 11-12, 1984
    b. **December 2-3, 1984**
    c. December 5-6, 1984
    d. December 14-15, 1984

73. Which of the following is a seismic wave?
    a. **Tsunami**
    b. Hurricane
    c. El Nino
    d. Typhoon

74. Hurricanes are common in
    a. India
    b. Bangladesh
    c. **USA**
    d. Australia

75. Which is the most fire-prone country in the World
    a. India
    b. **Australia**
    c. Bangladesh
    d. Pakistan

76. The number of immediate deaths officially reported due to Bhopal gas tragedy on 2-3, December 1984 was around _____
    a. 9258
    b. 5432
    c. 3592
    d. **2259**

77. When the outbreak of any disease was restricted to one country, it is called
    a. **Epidemic**
    b. Endemic
    c. Pandemic
    d. Hypodermic

78. DART mooring system is used for which disaster?
    a. Earthquake
    b. **Tsunami**
    c. Mining
    d. Forest Fire

79. Super Cyclone has the speed over _____
    a. 90 mph
    b. **137 mph**
    c. 500 mph
    d. 1000 mph

80. The annual flood peaks in India are recorded in months of:
    a. June, July
    b. February, March
    c. March, April
    d. **August, September**

81. The first step in preparedness planning is:
    a. Analysis of data collected
    b. **Determination of objectives**
    c. Development of implementing device
    d. Determination of strategy

82. The cyclone “Fani” which hit Orissa in 2019, was categorized as:
    a. Category 2 cyclone
    b. **Category 4 cyclone**
    c. Super cyclone
    d. Category 3 cyclone

83. The Sendai Framework for Disaster Risk Reduction (SFDDR) focuses on Disaster management globally. It was adopted in:
    a. 2013
    b. **2015**
    c. 2018
    d. 2020

84. The National Disaster Response Force (NDRF) was constituted under which Act?
    a. Armed Forces Special Powers Act
    b. **National Disaster Management Act**
    c. Civil Defence Act
    d. Environment Protection Act

85. Which of the following initiatives is aimed at developing infrastructure resilient to disasters in India?
    a. Pradhan Mantri Jan Dhan Yojana
    b. **Coalition for Disaster Resilient Infrastructure**
    c. Swachh Bharat Mission
    d. National Clean Energy Mission

86. The 2004 Indian ocean tsunami resulted in the creation of which of the following institutions in India?
    a. Indian Ocean Tsunami Warning Centre
    b. **Indian Tsunami Early Warning Centre**
    c. National Institute of Disaster Management
    d. National Oceanographic Research Centre

87. Which cyclone in 2020 severely affected West Bengal and Odisha?
    a. Cyclone Fani
    b. **Cyclone Amphan**
    c. Cyclone Vardah
    d. Cyclone Hudhud

88. In India, which of the following hazards are monitored by the Geological Survey of India (GSI)?
    a. **Landslides**
    b. Tsunami
    c. Droughts
    d. Cyclones

89. Which section of the national disaster management Act, 2005 deals with the role of local authorities in disaster management?
    a. Section 35
    b. **Section 41**
    c. Section 62
    d. Section 76

90. Which one of the following is a geological disaster?
    a. **Tsunami**
    b. Chemical attack
    c. Terrorist attack
    d. Nuclear attack

91. The cycle of disaster consists of the following components
    a. **Mitigation, preparedness, Response, Recovery**
    b. Preparedness, Vulnerability assessment, risk assessment, recovery
    c. Mitigation, Risk assessment, Response, Recovery
    d. Risk assessment, Recovery, Mitigation, Response

92. DDMA is headed by
    a. **District Magistrate**
    b. Chief Secretary
    c. BDO
    d. Chief Minister

93. Why is community preparedness vital for mitigating earthquake impact?
    a. It helps predict earthquakes accurately
    b. It eliminates the need for government aid
    c. It prevents earthquakes from occurring
    d. **It empowers individuals to take immediate safety measures**

94. What is the primary characteristic of a cyclone?
    a. High temperature
    b. **Low atmospheric pressure**
    c. High pressure
    d. Drought

95. What is the 'eye' of the cyclone?
    a. The outer rain bands of the cyclone
    b. The point where the cyclone makes landfall
    c. **A relatively calm zone at the center of the cyclone**
    d. The area of the strongest winds in the cyclone

96. Which river basin in India experiences the most flood affected areas?
    a. **Ganga basin**
    b. Narmada basin
    c. Godavari basin
    d. Krishna basin

97. Which organisation in India is responsible for issuing flood warnings?
    a. **Central Water Commission**
    b. Indian Meteorological Department
    c. National Disaster Management Authority
    d. Geological Survey of India

98. Which of these is a structural measure for flood management?
    a. Flood forecasting
    b. **Construction of embankments**
    c. Flood plain zoning
    d. Disaster preparedness

99. Why is drought considered a 'slow-onset' disaster?
    a. Its impact is not immediately visible
    b. It only affects a small geographic area
    c. **It is difficult to determine its exact beginning and end**
    d. It takes a long time for relief efforts to reach affected areas

100. How does agricultural drought directly impact human populations?
    a. By decreasing water availability for drinking
    b. By increasing mortality due to starvation
    c. **By decreasing crop yields and leading to food shortages**
    d. By causing mass migration of farmers