

Test Booklet Series



**Test Booklet
(Computer Application)**

Test Booklet No.

Name of Applicant

Answer Sheet No.

Applicant ID/Roll No. :

Signature of Applicant :

Date of Examination :

Signature of the Invigilator(s)

Time of Examination :

1.

2.

Duration : 2 Hour]

[Maximum Marks : 100

IMPORTANT INSTRUCTIONS

- (i) The question paper is in the form of Test-Booklet containing **100 (Hundred)** questions. All questions are compulsory. Each question carries four answers marked (A), (B), (C) and (D), out of which only one is correct. Choose the correct option or the most appropriate option.
- (ii) On receipt of the Test-Booklet (Question Paper), the candidate should immediately check it and ensure that it contains all the pages, i.e., **100** questions. Discrepancy, if any, should be reported by the candidate to the invigilator immediately after receiving the Test-Booklet.
- (iii) A separate Answer-Sheet is provided with the Test-Booklet/Question Paper. On this sheet there are **100** rows containing four circles each. One row pertains to one question.
- (iv) The candidate should write his/her Application ID/Roll number at the places provided on the cover page of the Test-Booklet/Question Paper and on the Answer-Sheet and **NOWHERE ELSE**.
- (v) No second Test-Booklet/Question Paper and Answer-Sheet will be given to a candidate. The candidates are advised to be careful in handling it and writing the answer on the Answer-Sheet.
- (vi) For every correct answer of the question **One (1) mark will be awarded**.
- (vii) Marking shall be done only on the basis of answers responded on the Answer-Sheet.
- (viii) To mark the answer on the Answer-Sheet, candidate should darken the appropriate circle in the row of each question with Blue or Black pen.
- (ix) For each question only **one** circle should be **darkened** as a mark of the answer adopted by the candidate. If more than one circle for the question are found darkened or with one black circle any other circle carries any mark, the answer will be treated as incorrect.
- (x) The candidates should not remove any paper from the Test-Booklet/Question Paper. Attempting to remove any paper shall be liable to be punished for use of unfair means.
- (xi) Rough work may be done on the blank space provided in the Test-Booklet/Question Paper only.
- (xii) *Mobile phones (even in Switch-off mode) and such other communication/programmable devices are not allowed inside the examination hall.*
- (xiii) No candidate shall be permitted to leave the examination hall before the expiry of the time.

DO NOT OPEN THIS QUESTION BOOKLET UNTIL ASKED TO DO SO.

PART-A
(Research Methodology)

1. The main objective of fundamental/basic research is:
(A) To solve an immediate practical problem
(B) To discover new facts and develop theories
(C) To evaluate existing social programs
(D) To study historical events

2. The scientific method of research is characterized by:
(A) Subjectivity and intuition
(B) Empiricism, objectivity, and replicability
(C) Relying solely on authority
(D) Lack of logical reasoning

3. While selecting a research topic, which of the following is the LEAST important consideration?
(A) Feasibility of the study
(B) Researcher's interest
(C) Availability of funds and time
(D) Personal biases of the researcher

4. The ethical principle of "Informed Consent" implies that:
(A) Participants must be forced to participate for the greater good
(B) Participants must be fully aware of the research procedures and agree voluntarily
(C) Researchers can hide the true purpose of the study to avoid bias
(D) Data can be shared publicly without participant knowledge

5. Fabrication, falsification, and plagiarism in research are collectively known as:
(A) Research misconduct
(B) Sampling error
(C) Ethical compliance
(D) Research methodology

6. Which research design is primarily concerned with describing the characteristics of a population or phenomenon?
(A) Exploratory research design
(B) Descriptive research design
(C) Experimental research design
(D) Diagnostic research design

7. In an experimental research design, the variable that is intentionally manipulated by the researcher is the:
(A) Dependent variable
(B) Extraneous variable
(C) Independent variable
(D) Control variable

8. Research conducted to find out the causes of an event that has already happened, without manipulating variables, is known as:
- (A) Action research (B) Ex-post facto research
(C) Applied research (D) Pure research
9. The "Control Group" in an experimental design is used to:
- (A) Introduce the experimental treatment
(B) Serve as a baseline for comparison with the experimental group
(C) Eliminate the dependent variable
(D) Increase the sample size
10. Deductive reasoning in the scientific method moves from:
- (A) Specific observations to general theories
(B) General theories to specific hypotheses
(C) Empirical data to conceptualization
(D) Null hypothesis to alternative hypothesis
11. Internal validity in an experimental design refers to:
- (A) The generalizability of the findings to the real world
(B) The certainty that the independent variable caused the changes in the dependent variable
(C) The consistency of the measuring instrument
(D) The representativeness of the sample
12. If every member of the population has an equal and independent chance of being selected, the sampling technique is called:
- (A) Purposive sampling (B) Convenience sampling
(C) Simple random sampling (D) Quota sampling
13. When the population is heterogeneous with distinct subgroups (strata), the most appropriate probability sampling technique is:
- (A) Simple random sampling (B) Stratified random sampling
(C) Cluster sampling (D) Snowball sampling

- 14.** In cluster sampling, the sampling units selected are:
- (A) Individual elements
 - (B) Natural groupings or categories (e.g., districts, schools)
 - (C) Homogeneous subgroups
 - (D) Volunteers
- 15.** Snowball sampling is specifically used when:
- (A) The population size is very large
 - (B) The sampling frame is readily available
 - (C) The population is hidden, rare, or difficult to access
 - (D) The researcher needs a perfectly representative sample
- 16.** The difference between a sample statistic and the true population parameter is termed as:
- (A) Systematic error
 - (B) Sampling error
 - (C) Measurement error
 - (D) Non-sampling error
- 17.** Which measurement scale classifies data into mutually exclusive categories without any order or ranking?
- (A) Ordinal scale
 - (B) Interval scale
 - (C) Nominal scale
 - (D) Ratio scale
- 18.** A Likert scale (Strongly Disagree to Strongly Agree) is technically an example of:
- (A) Nominal scale
 - (B) Ordinal scale
 - (C) Interval scale
 - (D) Ratio scale
- 19.** Which scaling technique asks respondents to rate an object on a series of bipolar adjectives (e.g., Good-Bad, Fast-Slow)?
- (A) Likert scale
 - (B) Guttman scale
 - (C) Semantic Differential scale
 - (D) Thurstone scale

- 20.** The key difference between a questionnaire and a schedule is:
- (A) A questionnaire is filled by the enumerator, a schedule is filled by the respondent
 - (B) A questionnaire is filled by the respondent, a schedule is filled by the enumerator/ interviewer
 - (C) A schedule is mailed, a questionnaire is given face-to-face
 - (D) There is no difference between them
- 21.** Data collected by the researcher themselves for the specific purpose of the current study is called:
- (A) Secondary data
 - (B) Primary data
 - (C) Official data
 - (D) Documentary data
- 22.** The process of checking the raw data to ensure completeness, accuracy, and consistency before analysis is called:
- (A) Coding
 - (B) Editing
 - (C) Tabulation
 - (D) Classification
- 23.** Assigning numerical values or symbols to the responses for computational purposes is known as:
- (A) Editing
 - (B) Coding
 - (C) Transcription
 - (D) Tabulation
- 24.** A histogram is used to graphically represent the distribution of:
- (A) Discrete/categorical data
 - (B) Continuous data grouped into class intervals
 - (C) Qualitative characteristics
 - (D) Proportions of a whole
- 25.** A pie chart is most effective for representing:
- (A) Trends over time
 - (B) The relationship between two continuous variables
 - (C) The percentage breakdown of a whole
 - (D) Frequency distribution of continuous data

26. A hypothesis that states there is no significant difference or relationship is called:
- (A) Directional hypothesis
 - (B) Non-directional hypothesis
 - (C) Null hypothesis
 - (D) Alternative hypothesis
27. "Students who study using method A will score significantly higher than those who study using method B." This is an example of:
- (A) Null hypothesis
 - (B) Directional alternative hypothesis
 - (C) Non-directional alternative hypothesis
 - (D) Ex-post facto hypothesis
28. A Type I error in hypothesis testing occurs when:
- (A) We fail to reject a true null hypothesis
 - (B) We reject a true null hypothesis
 - (C) We fail to reject a false null hypothesis
 - (D) We reject a false null hypothesis
29. The probability of committing a Type I error is denoted by:
- (A) Beta (β)
 - (B) Alpha (α)
 - (C) P-value
 - (D) Standard error
30. A statistical test that makes assumptions about the population parameters (like normal distribution, homogeneity of variance) is called:
- (A) Non-parametric test
 - (B) Parametric test
 - (C) Chi-square test
 - (D) Distribution-free test
31. The Chi-square (χ^2) test is primarily used to test:
- (A) The difference between means of two groups
 - (B) The association between two categorical variables
 - (C) The significance of regression coefficients
 - (D) The variance within a single group

32. In a Chi-square test of independence, if the calculated value of χ^2 is greater than the critical/ table value at the 0.05 level, we:
- (A) Accept the null hypothesis
 - (B) Reject the null hypothesis
 - (C) Conclude the variables are independent
 - (D) Conclude the sample is biased
33. The formula for calculating expected frequency (E) in a Chi-square contingency table cell is:
- (A) (Row Total $\times$ Column Total) / Grand Total
 - (B) (Row Total + Column Total) / Grand Total
 - (C) Grand Total / (Row Total $\times$ Column Total)
 - (D) Row Total / Column Total
34. Analysis of Variance (ANOVA) is used instead of multiple t-tests to compare the means of three or more groups because:
- (A) ANOVA is easier to calculate
 - (B) Multiple t-tests increase the risk of Type I error
 - (C) ANOVA does not require normal distribution
 - (D) ANOVA uses nominal data
35. In a one-way ANOVA, the "one way" refers to:
- (A) One dependent variable and one independent variable with multiple levels
 - (B) One independent variable and multiple dependent variables
 - (C) Only one sample being tested
 - (D) One-tailed test of significance
36. The F-ratio in One-way ANOVA is calculated as:
- (A) Within-group variance / Between-group variance
 - (B) Between-group variance / Within-group variance
 - (C) Total variance / Residual variance
 - (D) Mean square error / Mean square total
37. The degrees of freedom for "Between Groups" in a One-Way ANOVA with 'k' groups is:
- (A) $N - 1$
 - (B) $N - k$
 - (C) $k - 1$
 - (D) $(N - 1) - (k - 1)$

38. Which of the following is a non-parametric alternative to One-way ANOVA?
- (A) Kruskal-Wallis test (B) Mann-Whitney U test
(C) Wilcoxon signed-rank test (D) Chi-square goodness of fit
39. A multivariate statistical technique used to reduce a large number of interrelated variables to a smaller set of unobservable factors is:
- (A) Cluster Analysis (B) Factor Analysis
(C) Discriminant Analysis (D) Conjoint Analysis
40. In Factor Analysis, the proportion of variance in a specific variable explained by the common factors is called:
- (A) Communality (B) Eigenvalue
(C) Factor loading (D) Uniqueness
41. Which concept in Factor Analysis represents the total variance explained by a specific factor across all variables?
- (A) Communality (B) Eigenvalue
(C) Factor score (D) Rotation
42. Multiple Regression is used to:
- (A) Classify objects into groups
(B) Predict the value of a dependent variable based on two or more independent variables
(C) Reduce the number of variables
(D) Determine the association between two categorical variables
43. In Multiple Regression, the coefficient of multiple determination (R^2) represents:
- (A) The correlation between two independent variables
(B) The proportion of variance in the dependent variable explained by all independent variables
(C) The regression coefficient of the strongest predictor
(D) The standard error of the estimate
44. Pearson's correlation coefficient (r) measures:
- (A) The causal relationship between two variables
(B) The linear association between two continuous variables
(C) The association between two categorical variables
(D) The variance of a single variable

45. If the Pearson correlation coefficient between X and Y is -0.85 , it indicates:
- (A) A weak positive relationship (B) A strong positive relationship
(C) A strong negative relationship (D) No relationship
46. Which multivariate technique is used to group objects or individuals so that objects in the same group are highly similar to each other but different from objects in other groups?
- (A) Discriminant Analysis (B) Factor Analysis
(C) Cluster Analysis (D) Conjoint Analysis
47. The main difference between Cluster Analysis and Discriminant Analysis is that:
- (A) Cluster analysis requires predefined groups, discriminant analysis does not
(B) Discriminant analysis requires predefined groups, cluster analysis does not
(C) Cluster analysis uses metric data, discriminant analysis uses non-metric
(D) Discriminant analysis is for data reduction, cluster analysis is for prediction
48. Conjoint Analysis is primarily used in marketing research to:
- (A) Determine the optimal number of clusters
(B) Measure how consumers value different features of a product by analyzing trade-offs
(C) Reduce the dimensions of product features
(D) Classify customers into predefined demographic groups
49. The standard format for writing a quantitative research report is generally known by the acronym:
- (A) IMRAD (Introduction, Method, Results, And Discussion)
(B) PEST (Political, Economic, Social, Technological)
(C) SWOT (Strengths, Weaknesses, Opportunities, Threats)
(D) APA (American Psychological Association)
50. Which section of the research report contains a brief summary of the entire study, including the problem, methodology, major findings, and conclusions?
- (A) Introduction (B) Abstract/Executive Summary
(C) Literature Review (D) Discussion

PART-B
(Computer Application)

- 51.** Which of the following data structures follows the LIFO (Last In First Out) principle?
- (A) Queue (B) Stack
(C) Tree (D) Graph
- 52.** In a relational database, which constraint ensures that a column cannot have NULL values and all values must be unique?
- (A) Foreign Key (B) Check Constraint
(C) Primary Key (D) Default Constraint
- 53.** What is the determinant of an Identity matrix of size $n \times n$?
- (A) 0 (B) n
(C) 1 (D) n^2
- 54.** Which CPU scheduling algorithm allocates the CPU first to the process that requests the CPU first?
- (A) Round Robin (B) Shortest Job First
(C) Priority Scheduling (D) First-Come, First-Served (FCFS)
- 55.** How many layers are there in the OSI reference model?
- (A) 4 (B) 5
(C) 6 (D) 7
- 56.** In propositional logic, a statement that is always true regardless of the truth values of its components is called a:
- (A) Contradiction (B) Tautology
(C) Contingency (D) Fallacy
- 57.** If a set A has n elements, how many elements does its power set contain?
- (A) n^2 (B) $2n$
(C) 2^n (D) $n!$

58. The rank of a matrix is defined as:
- (A) The number of rows
 - (B) The number of columns
 - (C) The maximum number of linearly independent row vectors
 - (D) The sum of its diagonal elements
59. Evaluate the limit as x approaches 0 of $(\sin x)/x$:
- (A) 0
 - (B) 1
 - (C) Infinity
 - (D) Undefined
60. In a standard normal distribution, what are the values of the mean and standard deviation respectively?
- (A) 1 and 0
 - (B) 0 and 1
 - (C) 0 and 0
 - (D) 1 and 1
61. Which of the following flip-flops toggles its output when both inputs are HIGH?
- (A) D flip-flop
 - (B) T flip-flop
 - (C) JK flip-flop
 - (D) RS flip-flop
62. What is the 8-bit two's complement representation of -5 ?
- (A) 11111010
 - (B) 11111011
 - (C) 10000101
 - (D) 11110101
63. If a memory system has a cache hit ratio of 0.9, cache access time of 10 ns, and main memory access time of 100 ns, what is the effective access time?
- (A) 10 ns
 - (B) 19 ns
 - (C) 20 ns
 - (D) 100 ns
64. In which addressing mode is the operand explicitly specified in the instruction itself?
- (A) Direct addressing
 - (B) Indirect addressing
 - (C) Immediate addressing
 - (D) Register addressing

65. Which operation is typically faster in a doubly linked list compared to a singly linked list?
- (A) Searching for a random element
 - (B) Accessing the head node
 - (C) Deleting a given node when only its pointer is known
 - (D) Inserting a node at the head
66. What is the maximum number of nodes in a binary tree of height h (assuming root is at height 0)?
- (A) $2^{(h-1)}$
 - (B) $2^h - 1$
 - (C) $2^{(h+1)} - 1$
 - (D) 2^h
67. What is the worst-case time complexity of Merge Sort?
- (A) $O(n)$
 - (B) $O(n \log n)$
 - (C) $O(n^2)$
 - (D) $O(\log n)$
68. Dijkstra's shortest path algorithm is based on which algorithm design technique?
- (A) Dynamic Programming
 - (B) Divide and Conquer
 - (C) Greedy Method
 - (D) Backtracking
69. Which of the following strings is generated by the regular expression $(a + b)^*b$?
- (A) abaa
 - (B) bbab
 - (C) abab
 - (D) aaba
70. The Pumping Lemma is primarily used to prove that:
- (A) A language is regular
 - (B) A language is not regular
 - (C) A grammar is context-free
 - (D) A Turing machine halts
71. What is the primary output of the lexical analysis phase in compiler design?
- (A) Parse Tree
 - (B) Intermediate Code
 - (C) Stream of Tokens
 - (D) Symbol Table

72. Left recursion in a grammar causes problems for which type of parsers?
- (A) LR(1) Parsers (B) Top-Down Parsers
(C) Bottom-Up Parsers (D) LALR Parsers
73. In Operating Systems, what ensures that only one process can execute in its critical section at a time?
- (A) Multiprogramming (B) Context Switching
(C) Mutual Exclusion (D) Deadlock
74. Which concept allows the execution of processes that are not completely in memory?
- (A) Paging (B) Segmentation
(C) Virtual Memory (D) Swapping
75. A relation is in Second Normal Form (2 NF) if it is in 1 NF and:
- (A) Has no transitive dependencies
(B) Has no partial dependencies
(C) Has no multi-valued dependencies
(D) Every determinant is a candidate key
76. Which property of database transactions guarantees that once a transaction has been committed, it will remain so, even in the event of power loss?
- (A) Atomicity (B) Consistency
(C) Isolation (D) Durability
77. What is the length of an IPv4 address?
- (A) 16 bits (B) 32 bits
(C) 64 bits (D) 128 bits
78. Which of the following Transport layer protocols is connectionless and does not guarantee delivery?
- (A) TCP (B) SCTP
(C) UDP (D) FTP

79. A group $(G, *)$ is called an Abelian group if the operation $*$ satisfies which additional property?
- (A) Closure (B) Associativity
(C) Commutativity (D) Identity
80. In hashing, which technique resolves collisions by maintaining a linked list of elements that hash to the same slot?
- (A) Linear Probing (B) Quadratic Probing
(C) Double Hashing (D) Separate Chaining
81. Enqueue and Dequeue are standard operations associated with which data structure?
- (A) Stack (B) Queue
(C) Binary Tree (D) Hash Table
82. What is 'thrashing' in the context of Operating Systems?
- (A) Frequent swapping of pages leading to high CPU utilization
(B) A state where the CPU spends more time paging than executing processes
(C) Permanent blocking of a set of processes
(D) A technique to increase multi-programming
83. In Compiler Design, Syntax-Directed Translation heavily relies on attaching rules or actions to the productions of a:
- (A) Regular Expression (B) Turing Machine
(C) Context-Free Grammar (D) Symbol Table
84. Which SQL statement is used to extract data from a database?
- (A) EXTRACT (B) SELECT
(C) GET (D) OPEN
85. A MAC address is how many bits long?
- (A) 16 (B) 32
(C) 48 (D) 64

86. What is the generating function for the sequence 1, 1, 1, 1, ...?
- (A) $1 / (1 - x)^2$ (B) $1 / (1 - x)$
 (C) e^x (D) $1 / (1 + x)$
87. If matrix A has eigenvalues $\lambda_1, \lambda_2, \dots, \lambda_n$, what are the eigenvalues of matrix A^k (where k is a positive integer)?
- (A) $k * \lambda_1, k * \lambda_2, \dots$ (B) $\lambda_1, \lambda_2, \dots$
 (C) $\lambda_1^k, \lambda_2^k, \dots$ (D) $\lambda_1/k, \lambda_2/k, \dots$
88. In a pipeline execution, structural hazards occur due to:
- (A) Data dependencies between instructions
 (B) Control flow changes like branches
 (C) Resource conflicts when instructions overlap
 (D) Cache misses in memory
89. In minimization using Karnaugh maps, an 'essential prime implicant' is a prime implicant that:
- (A) Covers the maximum number of 1s
 (B) Contains at least one minterm not covered by any other prime implicant
 (C) Can be combined with don't care conditions
 (D) Is exactly equivalent to a single minterm
90. Which of the following problems is Turing-decidable?
- (A) Halting problem
 (B) Equivalence problem for Turing machines
 (C) Emptiness problem for Context-Free Grammars
 (D) Post Correspondence Problem
91. In Data Flow Analysis for compiler optimization, 'Liveness Analysis' is used primarily for:
- (A) Common Subexpression Elimination
 (B) Register Allocation
 (C) Constant Folding
 (D) Loop Unrolling

92. What is the primary purpose of the Banker's Algorithm in Operating Systems?
- (A) Process Scheduling (B) Deadlock Avoidance
(C) Page Replacement (D) Disk Scheduling
93. A B+ tree differs from a B tree in that:
- (A) Internal nodes do not store actual data records
(B) It has a lower branching factor
(C) It is unbalanced
(D) It cannot be used for database indexing
94. In CIDR notation, what does the network address 192.168.1.0/24 represent?
- (A) A network with 24 available IP addresses
(B) A subnet mask of 255.255.255.0
(C) A network spanning 24 subnets
(D) An IPv6 transition address
95. A matrix A can be factorized into $A = LU$ (where L is lower triangular and U is upper triangular) if and only if:
- (A) A is symmetric
(B) A is orthogonal
(C) All its leading principal minors are non-zero
(D) A is a diagonal matrix
96. Which of the following is true about Context-Free Grammars (CFGs)?
- (A) The ambiguity problem for CFGs is decidable
(B) The equivalence problem for two CFGs is decidable
(C) Deterministic Pushdown Automata accept all Context-Free Languages
(D) Intersection of two Context-Free Languages may not be Context-Free
97. What is the time complexity of the Matrix Chain Multiplication algorithm using Dynamic Programming?
- (A) $O(n^2)$ (B) $O(n^3)$
(C) $O(2^n)$ (D) $O(n \log n)$

- 98.** Kruskal's algorithm for finding the Minimum Spanning Tree uses which data structure to efficiently check for cycles?
- (A) Hash Map (B) Priority Queue
(C) Disjoint-Set (Union-Find) (D) B-Tree
- 99.** In TCP congestion control, how does the congestion window size increase during the 'Slow Start' phase?
- (A) Linearly (B) Exponentially
(C) Logarithmically (D) Remains Constant
- 100.** According to Bayes' Theorem, $P(A|B)$ is proportional to:
- (A) $P(B|A) * P(A)$ (B) $P(A) / P(B)$
(C) $P(B) * P(A \& B)$ (D) $P(A) * P(B)$

ROUGH WORK

ROUGH WORK