Test Booklet Series

A

Test Booklet
(Computer Engg.)

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

1. Research is
   (A) Searching again and again
   (B) Finding a solution to any problem
   (C) Working in a scientific way to search for the truth of any problem
   (D) None of the above

2. The conceptual framework in which research is conducted is called a
   (A) Synopsis of research
   (B) Research design
   (C) Research hypothesis
   (D) Research paradigm

3. What are the main characteristics of Scientific Research?
   (A) Empirical
   (B) Theoretical
   (C) Experimental
   (D) All the above

4. Which research design will be most appropriate to study the relationship between the level of aspirations and achievement of rural children?
   (A) Experimental Research Design
   (B) Ex Post Facto Research Design
   (C) Historical Research Design
   (D) Survey Research Design

5. The principles of fundamental research are used in:
   (A) action research
   (B) applied research
   (C) philosophical research
   (D) historical research

6. A shift in attitude in respondents between two points during data collection is called
   (A) Reactive effect
   (B) Maturation effect
   (C) Regression effect
   (D) Conditioning effect

7. Ethical Norms in research do not involve guideline for:
   (A) Thesis Format
   (B) Copyright
   (C) Patenting Policy
   (D) Data sharing Policy

8. The primary objective of an experimental research design is to:
   (A) Explore an unknown topic.
   (B) Establish cause-and-effect relationships.
   (C) Describe a population or situation.
   (D) Examine the relationship between variables without manipulation.

9. The research that aims at immediate application is:
   (A) Action Research
   (B) Empirical Research
   (C) Conceptual Research
   (D) Fundamental Research

10. A null hypothesis is
   (A) when there is no difference between the variables
   (B) the same as research hypothesis
   (C) subjective in nature
   (D) when there is difference between the variables

11. When the researcher rejects a true null hypothesis a ---------- error occurs.
   (A) Type I
   (B) Type A
   (C) Type II
   (D) Type B

12. The researcher is usually interested in supporting ..... when he or she is engaging in hypothesis testing:
   (A) The alternative Hypothesis
   (B) The null Hypothesis
   (C) Both alternative and null Hypothesis
   (D) Neither the alternative or null Hypothesis

13. A research design is often described as the "blueprint" for a research project. This emphasizes its role in:
   (A) Collecting data
   (B) Analysing data
   (C) Providing a strategy and framework for the study
   (D) Presenting findings

14. What is a cross-sectional research design?
(A) A design in which a data is collected at one point of time.
(B) A design in which data is collected over a period of time.
(C) A design in which data is collected from a representative sample of the population.
(D) A design in which data is collected from a non-representative sample of the population.

15. Match the measurement scale to the given variables:

Scale of measurement	**Variable**
(a) Nominal	(i) Height of student
(b) Ordinal	(ii) Time of day
(c) Interval	(iii) Caste
(d) Ratio	(iv) Rank of Army Personnel

Choose the correct answer from the options given below:
(A) (a) – (i), (b) – (ii), (c) – (iii), (d) – (iv)
(B) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)
(C) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)
(D) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii)

16. Which is the simplest form of Measurement?
(A) Ordinal (B) Nominal
(C) Ratio (D) Interval

17. The data is obtained through a survey conducted is called:
(A) Primary data (B) Secondary data
(C) Continuous data (D) Qualitative data

18. A survey in which the information is collected from each and every individual of the population is known as:
(A) Sample survey (B) Pilot survey
(C) Biased survey (D) Census survey

19. Interview is an example of which data?
(A) Primary data (B) Secondary data
(C) Both (A) and (B) (D) None of the above

20. What is the process of organizing raw data into rows and columns for systematic analysis called?
(A) Compilation
(B) Presentation
(C) Tabulation
(D) Classification

21. The graphical representation of a frequency distribution is called
(A) Bar chart
(B) Line chart
(C) Histogram
(D) Pie char

22. Identify the correct sequence of research steps:
(A) Selection of topic, review of literature, data collection, interpretation of findings
(B) Review of literature, selection of topic, data collection, and interpretation of findings
(C) Selection of topic, data collection, review of literature, interpretation of findings
(D) Selection of topic, review of literature, interpretation of findings, data collection

23. When a research problem is related to heterogeneous population, the most suitable sampling method is:
(A) Cluster Sampling
(B) Stratified Sampling
(C) Convenient Sampling
(D) Lottery Method

24. A researcher wants to study the long-term effects of a new teaching method on student performance over several years. Which research design would be most appropriate?
(A) Cross-sectional design
(B) Case study design
(C) Longitudinal design
(D) Survey design

25. From the list given below identify those which are called non-probability sampling procedures:
(i) Simple random sampling
(ii) Dimensional sampling
(iii) Snowball sampling
(iv) Cluster sampling
(v) Quota sampling
(vi) Stratified sampling
Choose the correct option
(A) (i), (ii) and (iii)
(B) (ii), (iv) and (v)
(C) (i), (iii) and (v)
(D) (ii). (iii) and (v)

26. Among the following types of sampling techniques, which one is also known as 'Judgmental' sampling?

(A) Quota sampling
(B) Convenience Sampling
(C) Cluster Sampling
(D) Purposive Sampling

27. The primary objective of an experimental research design is to:

(A) Explore an unknown topic.
(B) Establish cause-and-effect relationships.
(C) Describe a population or situation.
(D) Examine the relationship between variables without manipulation.

28. "Students from the pure mathematics background can crack a bank recruitment test"—Which type of hypothesis is this?

(A) Relational Hypothesis
(B) Descriptive hypothesis
(C) Two tailed Hypothesis
(D) Null Hypothesis

29. Parametric tests make assumptions on:

(A) The population size
(B) The underlying distribution
(C) The sample size
(D) The mean sample

30. If the researcher has a nominal data, which non parametric test will he/she can use:

(A) T-test
(B) Z-test
(C) Chi square test
(D) All the above

31. If a researcher needs to verify whether there is a significant difference between the means of two groups to test a hypothesis, which statistical method would he/she employ?

(A) Chi-square test
(B) Correlation coefficient
(C) Sign-test
(D) Student's t-test

32. Chi-square is used to analyse:

(A) Scores (B) Ranks

(C) Frequencies (D) None of these

33. On which of the following does the critical value for a chi-square statistic rely?

(A) The degrees of freedom (B) The sum of the frequencies

(C) The row totals (D) The number of variables

34. Calculated value of chi-square is always.....

(A) Positive (B) Negative

(C) Zero (D) None of these

35. Which of the following best describes the purpose of using ANOVA in research?

(A) ANOVA is used to compare the means of two groups.

(B) ANOVA is use to compare the means of more than two groups.

(C) ANOVA is used to determine the correlation between two variables.

(D) ANOVA is used to determine the interaction effect between dependent variables.

36. What do ANOVA calculate?

(A) T-Ratio (B) Chi-square

(C) Z-Ratio (D) F-Ratio

37. What is the primary goal of factor analysis?

(A) To predict a dependent variable from multiple independent variables.

(B) To reduce a large number of variables into a smaller set of underlying factors.

(C) To determine the causal relationship between variables.

(D) To calculate the correlation between two variables.

38. Which assumption is required for factor analysis?

(A) Extreme collinearity exists among variables.

(B) Variables have a skewed distribution.

(C) A linear relationship exists among variables.

(D) There are many outliers in the data.

39. When using Principal Component Analysis (a common method for factor analysis), what does the first principal component capture?
(A) The minimum variance.
(B) The mean deviation.
(C) The maximum variance.
(D) The average variance.

40. Which statistical measure is used to assess the sampling adequacy for conducting factor analysis?
(A) Kaiser-Meyer-Olkin (KMO) measure.
(B) Bartlett's test of sphericity.
(C) Eigenvalue.
(D) All of the above.

41. The process by which we estimate the value of dependent variable on the basis of one or more independent variable is called:
(A) Correlation
(B) Regression
(C) Residual
(D) Slope

42. The major characteristic of correlation analysis is to seek out
(A) Differences among variables
(B) Variations among variables
(C) Association among variables
(D) Regression among variables

43. A correlation coefficient (r) of –1.0 indicates a:
(A) Perfect positive correlation
(B) Weak positive correlation
(C) No correlation
(D) Perfect negative correlation

44. The statistical tool that studies the degree of association between two variables is called:
(A) Regression
(B) Standard error
(C) Index numbers
(D) Correlation

45. Which type of correlation analysis is appropriate for examining the relationship between variables with non-linear relationships?
(A) Pearson's correlation
(B) Spearman's rank correlation
(C) Both Pearson's and Spearman's
(D) Neither Pearson's nor Spearman's

46. What is the primary goal of cluster analysis?
(A) Classifying data into predefined groups.
(B) Predicting a continuous value.
(C) Grouping similar data points together based on their characteristics.
(D) Reducing the number of variables in a dataset.

47. The primary purpose of conjoint analysis is to:
(A) Identify which customer segments are most profitable.
(B) Determine the price elasticity of demand for an existing product.
(C) Quantify the value that consumers place on different features of a product or service.
(D) Predict sales volume for a new product with absolute certainty.

48. The most common type of conjoint analysis, which presents respondents with sets of product profiles and asks them to choose the one they prefer most, is known as:
(A) Adaptive Conjoint Analysis (ACA).
(B) Choice-Based Conjoint (CBC).
(C) Full-Profile Conjoint Analysis.
(D) Self-Explicated Conjoint Analysis.

49. Which statement is an accurate representation of a "trade-off" in conjoint analysis?
(A) A decision to buy a product from one brand over another.
(B) A decision to delay a purchase until a later date.
(C) A customer choosing a larger screen over longer battery life for a phone.
(D) A customer buying a product with all the most desired features.

50. What is the primary purpose of discriminant analysis?
(A) To determine the effect of independent variables on a continuous dependent variable.
(B) To identify the underlying structure or dimensions within a set of variables.
(C) To classify cases into two or more distinct, pre-defined groups based on a set of predictor variables.
(D) To cluster data points into a specific number of groups based on their similarities.

PART–B

(Computer Engg.)

51. Which of the following sorting algorithms has the best worst-case time complexity?

(A) Quick sort
(B) Merge sort
(C) Heap sort
(D) Bubble sort

52. In Round-Robin scheduling, increasing time quantum tends to:

(A) Increase context switches
(B) Decrease context switches
(C) Increase overhead infinitely
(D) Make it preemptive

53. What is the space complexity of storing an adjacency matrix for a graph with n vertices?

(A) O(n)
(B) O(n log n)
(C) O(n^2)
(D) O(m) where m is number of edges

54. A language is context-free but not regular. Which of the following must be true?

(A) It can be recognized by a finite automaton
(B) It requires at least a pushdown automaton to be recognized
(C) It is not decidable
(D) It is deterministic context-free

55. Consider a CPU with a clock rate of 2 GHz and an instruction mix where arithmetic instructions take 1 cycle, memory accesses 3 cycles, and branches 2 cycles. If the program has 50% arithmetic, 30% memory and 20% branches, what is the CPI?

(A) 1.5
(B) 1.8
(C) 2.0
(D) 2.4

56. In relational databases, which normal form removes transitive dependencies?

(A) 1 NF
(B) 2 NF
(C) 3 NF
(D) BCNF

57. Which scheduling algorithm is optimal (minimizes average waiting time) for a single CPU when all jobs arrive at time zero and preemption is allowed?

(A) FCFS

(B) SJF (non-preemptive)

(C) SRTF (Shortest Remaining Time First)

(D) Round Robin

58. In TCP, which field ensures in-order delivery of bytes to the receiving application?

(A) Sequence number

(B) Acknowledgment number

(C) Window size

(D) Checksum

59. The Master Theorem solves recurrence relations of the form T(n)=a T(n/b)+f(n). For T(n) = 2T(n/2) + n, what is T(n)?

(A) O(n)

(B) O(n log n)

(C) O(n^2)

(D) O(log n)

60. Which of the following is a disadvantage of external sorting?

(A) Requires large internal memory

(B) Inefficient for small files

(C) I/O bound due to disk accesses

(D) Cannot sort data larger than memory

61. RSA security relies on the difficulty of which problem?

(A) Discrete logarithm

(B) Integer factorization

(C) Elliptic curve discrete log

(D) Subset sum

62. Which cache mapping technique allows any block to be placed in any cache line?

(A) Direct mapping

(B) Fully associative

(C) Set associative

(D) Indexed mapping

63. Which of the following is true about NP-complete problems?

(A) They are solvable in polynomial time

(B) Every problem in NP reduces to them in polynomial time

(C) They are a subset of P

(D) They are undecidable

64. Which data structure is best suited to implement Dijkstra's shortest path algorithm for a sparse graph?

(A) Adjacency matrix + array

(B) Adjacency list + min-heap (priority queue)

(C) Edge list + stack

(D) Adjacency matrix + BFS queue

65. In relational algebra, which operator corresponds to the SQL JOIN?

(A) Selection (σ)

(B) Projection (π)

(C) Cartesian product followed by selection ($\sigma(R \times S)$)

(D) Union ($\cup$)

66. Which of the following is NOT a correct statement about context-free grammars (CFG)?

(A) Every regular grammar is a CFG

(B) Every CFL can be parsed in O(n^3) time by CKY algorithm

(C) Ambiguous grammars define multiple parse trees for same string

(D) All CFGs are deterministic

67. Which of the following RAID levels provides mirroring without striping?

(A) RAID 0 (B) RAID 1

(C) RAID 5 (D) RAID 6

68. For a finite automaton with n states, the language complement can be obtained by :

(A) Adding a new start state

(B) Converting to NFA

(C) Swapping accepting and non-accepting states (after determinization and completion)

(D) Removing ε-transitions only

69. The eigenvalues of the matrix [[0,1], [-1,0]] are:

(A) 1, –1 (B) i, –i

(C) 0, 0 (D) 2, –2

70. Which of the following algorithms uses dynamic programming?

(A) Kruskal's MST (B) Prim's MST

(C) Bellman-Ford shortest path (D) Dijkstra's with min-heap

71. In Operating Systems, which synchronization primitive can be used to implement mutual exclusion and also to synchronize ordering?

(A) Semaphore (B) Timer interrupt

(C) Page table (D) Scheduler

72. Which addressing mode uses an offset added to a base address held in a register?

(A) Immediate

(B) Direct

(C) Base + displacement (register indirect with offset)

(D) Register

73. In databases, which isolation level may allow non-repeatable reads but prevents dirty reads?

(A) Read Uncommitted (B) Read Committed

(C) Repeatable Read (D) Serializable

74. What is the time complexity of building a binary heap from an unsorted array of n elements using Floyd's algorithm?

(A) O(n log n)
(B) O(n)
(C) O(log n)
(D) O(n^2)

75. Which logic minimization technique guarantees minimum sum-of-products form?

(A) Karnaugh map (practical)
(B) Quine-McCluskey algorithm
(C) Boolean algebraic simplification
(D) Espresso heuristic

76. In a pipelined processor, data hazards can be resolved by:

(A) Cache coherence
(B) Branch prediction
(C) Forwarding (bypassing) or pipeline stalls
(D) Increasing cache size

77. Which of the following is a property of a good hash function for hash tables?

(A) Deterministic and distributes keys uniformly
(B) Uses only the first byte of key
(C) Always returns consecutive integers
(D) Depends only on table size

78. In compiler design, which phase checks types and builds the annotated parse tree?

(A) Lexical analysis
(B) Syntax analysis (parsing)
(C) Semantic analysis
(D) Code generation

79. Which wireless medium has the highest typical propagation speed?

(A) Optical fiber
(B) Copper twisted pair
(C) Wireless RF
(D) Coaxial cable

80. Which algorithm is used for finding strongly connected components in a directed graph in linear time?

(A) Dijkstra's algorithm
(B) Kosaraju's algorithm
(C) Prim's algorithm
(D) Floyd-Warshall algorithm

81. In probability, if events A and B are independent, $P(A \cup B) = ?$

(A) $P(A) + P(B)$
(B) $P(A) + P(B) - P(A)P(B)$
(C) $P(A)P(B)$
(D) $P(A|B) + P(B|A)$

82. Which one of the following is NOT a SQL DDL command?

(A) CREATE
(B) DROP
(C) SELECT
(D) ALTER

83. The TCP three-way handshake consists of which sequence?

(A) SYN, ACK, SYN–ACK
(B) SYN, SYN–ACK, ACK
(C) ACK, SYN, SYN–ACK
(D) SYN–ACK, SYN, ACK

84. Deadlock avoidance algorithm is :

(A) Banker's algorithm
(B) Paging
(C) Swapping
(D) Thrashing

85. Which system call creates a new process by duplicating the calling process?

(A) exec()
(B) fork()
(C) spawn()
(D) create()

86. For a balanced binary search tree , what is the worst-case height for n nodes?

(A) O(log n)
(B) O(n)
(C) O(n log n)
(D) O(1)

87. Which of the following routing algorithms is distance-vector based?

(A) OSPF
(B) Dijkstra's algorithm
(C) RIP (D) Link-state routing

88. A processor runs at 2 GHz. If program has CPI = 1.5, the average instruction time is :

(A) 0.75 ns
(B) 1.5 ns
(C) 0.5 ns
(D) 2 ns

89. If a system has CPU utilization U = 1 – p^n where p is fraction waiting for I/O and n processes, for p = 0.6 and n = 3, U = ?

(A) 1 – 0.216 = 0.784
(B) 1 – 0.6^3 = 0.784
(C) 0.6^3 = 0.216
(D) 0.6

90. In binary relations, a relation that is reflexive, antisymmetric, and transitive is called :

(A) Equivalence relation
(B) Partial order
(C) Total order
(D) Symmetric relation

91. A table has 1024 rows. If you use a hash index with uniform distribution into 16 buckets, expected rows per bucket:

(A) 64
(B) 128
(C) 16
(D) 256

92. Shannon capacity C = B log 2(1 + SNR). For B = 3 MHz and SNR = 30 dB (i.e., power ratio 10^(30/10) = 1000), approximate C ≈ ?

(A) 3e6 * log2(1001) ≈ 3e6 * 9.97 ≈ 29.9 Mbps
(B) 3 Mbps
(C) 30 Mbps
(D) 300 Mbps

93. Which of the following is an NP problem that is in P for special cases, e.g., when graph is a tree?

(A) Hamiltonian cycle
(B) 3-SAT
(C) Graph coloring (k = 2)
(D) Travelling Salesman Problem

94. Which protocol is used to securely exchange symmetric keys over an insecure channel?

(A) FTP
(B) Diffie-Hellman key exchange
(C) HTTP
(D) DNS

95. The worst-case time complexity of searching an element in a red-black tree is :

(A) O(1)
(B) O(log n)
(C) O(n)
(D) O(n log n)

96. In databases, which indexing method is best suited for range queries on ordered data?

(A) Hash index
(B) B + tree index
(C) Bitmap index (for high-cardinality)
(D) Unindexed scan

97. Which of the following is true about ACID properties in databases?

(A) Atomicity allows partial commit
(B) Consistency ensures system moves from one valid state to another
(C) Isolation allows all transactions to see each other's intermediate states
(D) Durability allows rollback after crash

98. Which algorithm is used for substring pattern matching with linear average-case time using preprocessing of the pattern?

(A) Naive string matching
(B) Knuth-Morris-Pratt (KMP)
(C) Bubble search
(D) Selection search

99. In digital logic, the minimal number of 2-input NAND gates needed to implement a 2-input XOR is :

(A) 2
(B) 3
(C) 4
(D) 5

100. Semaphore initially set to 1 is called :

(A) Counting semaphore
(B) Binary semaphore
(C) Mutex only
(D) Spinlock

ROUGH WORK

ROUGH WORK