SET A **GR Number: _____**

Swaminarayan University
MIDTERM EXAM-November 2025

Subject Frontend: Mathematics-I **GR Number:_____**
Exam Date: 20 Nov 2025 **SUK Number:_____**

1. Which of the following is a subset of {1,2,3}?
A. {1,4} B. {3,4} C. {4} D. {2,3}

2. Power set of {a,b} contains how many elements?
A. 5 B. 4 C. 3 D. 2

3. If A = {1,2,3} and B = {3,4,5}, then A ∪ B = ?
A. {4,5} B. {3} C. {1,2,3,4,5} D. {1,2}

4. If U = {1,2,3,4,5} and A = {1,3,5}, A' is:
A. {4,5} B. {2,4} C. {1,3,5} D. {1,2,3}

5. In a function f : A → B, A is called:
A. Range B. Subset C. Domain D. Codomain

6. A function means:
A. One input → many outputs B. Every element of codomain must be mapped
C. One input → exactly one output D. None

7. A statement is:
A. Either true or false B. None C. A question D. A command

8. The connective ¬P represents:
A. Conjunction B. Implication C. Negation D. Disjunction

9. P ∧ Q is true when:
A. Both P & Q are true B. P is false C. P is true D. Q is true

10. P → Q is false only when:
A. Both are false B. P true, Q false C. Both true D. P false, Q true

11. Always true statement is:
A. Contradiction B. Predicate C. Tautology D. Proposition

12. Predicate logic uses:
A. Both A & B B. Variables C. None D. Quantifiers

13. Mathematical induction proves statements about:
A. Complex numbers B. Real numbers C. None D. Natural numbers

14. Multiplication rule applies to:
A. Independent only B. Events in sequence C. Unrelated event D. Mutually exclusive events

15. Subsets of size 3 from 5 elements:
A. 5 B. 10 C. 6 D. 20

16. The degree of a vertex in an undirected graph refers to:
A. Number of edges divided by number of vertices B. Number of edges incident to the vertex
C. Number of loops only D. Number of connected components

17. A path that starts and ends at the same vertex is called:
A. Walk B. Trail C. Cycle D. Chain

18. Which of the following graphs must be directed?
A. Weighted graph B. Simple graph C. Complete graph D. None of the above

19. In a weighted graph, edge weights usually represent:
A. Number of vertices B. Cost, distance, or time
C. Graph coloring value D. Direction of traversal

20. A graph with all edges having arrows is known as:
A. Undirected graph B. Directed graph C. Mixed graph D. Simple graph

21. A subgraph of a graph G is:
A. A graph formed by adding new vertices to G
B. A graph containing some vertices and edges of G
C. A graph with larger degree than G
D. Always a disconnected graph

22. In a tree, the number of edges is:
A. Equal to number of vertices B. One less than number of vertices
C. One more than number of vertices D. Always equal to 2n

23. In a tree, the degree of a node refers to:
A. Height of the tree B. Number of children the node has
C. Level of the node D. Number of siblings the node has

24. Which of the following is true for a full binary tree?
A. Every internal node has exactly 2 children B. Every leaf has exactly 2 parents
C. Some nodes can have only 1 child D. There is only one connected component

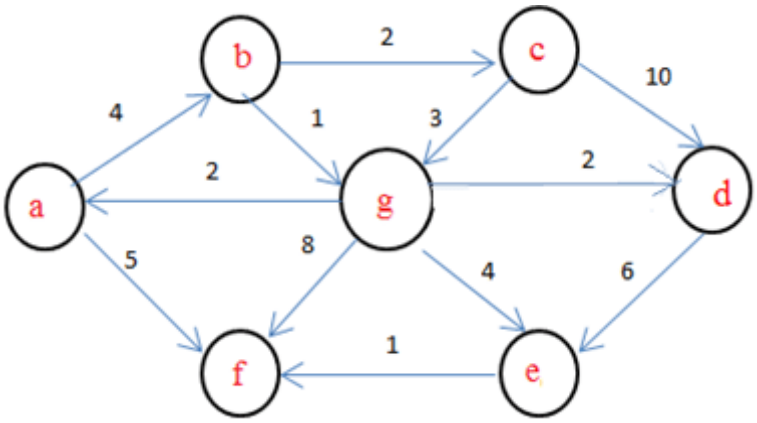
25. A complete binary tree has:
A. All levels completely filled

B. All levels filled except possibly the last, filled from right to left
C. All levels filled except possibly the last, filled from left to right
D. No internal nodes

26. An almost complete (nearly complete) binary tree is:
A. A tree with only one internal node
B. A binary tree with exactly one leaf
C. Similar to a complete binary tree, but last level may not be perfectly complete
D. A tree where all leaves are at same level

27. The time complexity to find a Eulerian path in a graph of vertex V and edge E is:
A. O(V2) B. O(V+E-1) C. O(V+E) D. O(E+1)

28. If b is the source vertex, what is the minimum cost to reach f vertex?



A. 8 B. 9 C. 4 D. 6

29. The maximum number of times the decrease key operation performed in Dijkstra's algorithm will be equal to:
A. Total number of vertices B. Total number of edges
C. Number of vertices – 1 D. Number of edges – 1

30. How many times the insert and extract min operations are invoked per vertex?
A. 1 B. 2 C. 3 D. 0

31. Dijkstra's Algorithm cannot be applied on:
A. Directed and weighted graphs B. Graphs having negative weight function
C. Unweighted graphs D. Undirected and unweighted graphs

32. Dijkstra's Algorithm is used to solve:
A. All pair shortest path B. Single source shortest path
C. Network flow D. Sorting

33. Which of the following is the most commonly used data structure for implementing Dijkstra's Algorithm?
A. Max priority queue B. Stack C. Circular queue D. Min priority queue

34. Dijkstra's shortest path algorithm was invented by:
A. Donald Knuth B. Alan Turing C. Edsger W. D. John von Neumann

35. Time Complexity of DFS is? (V – number of vertices, E – number of edges)
A. O(V + E) B. O(V) C. O(E) D. O(V*E)

36. The Data structure used in standard implementation of Depth First Search is?
A. Stack B. Queue C. Linked List D. Tree

37. A person wants to visit some places starting from a vertex and explore level by level. What algorithm should be used?
A. Depth First Search B. Breadth First Search
B. Trim's algorithm D. Kruskal's algorithm

38. For the adjacency matrix of a directed graph the row sum is the _____ degree and the column sum is the _____ degree.
A. in, out B. out, in C. in, total D. total, out

39. Which of the following is not an advantage of trees?
A. Hierarchical structure B. Faster search
C. Router algorithms D. Undo/Redo operations in a notepad

40. The number of edges from the root to the node is called _____ of the tree.
A. Height B. Depth
C. Length D. Width