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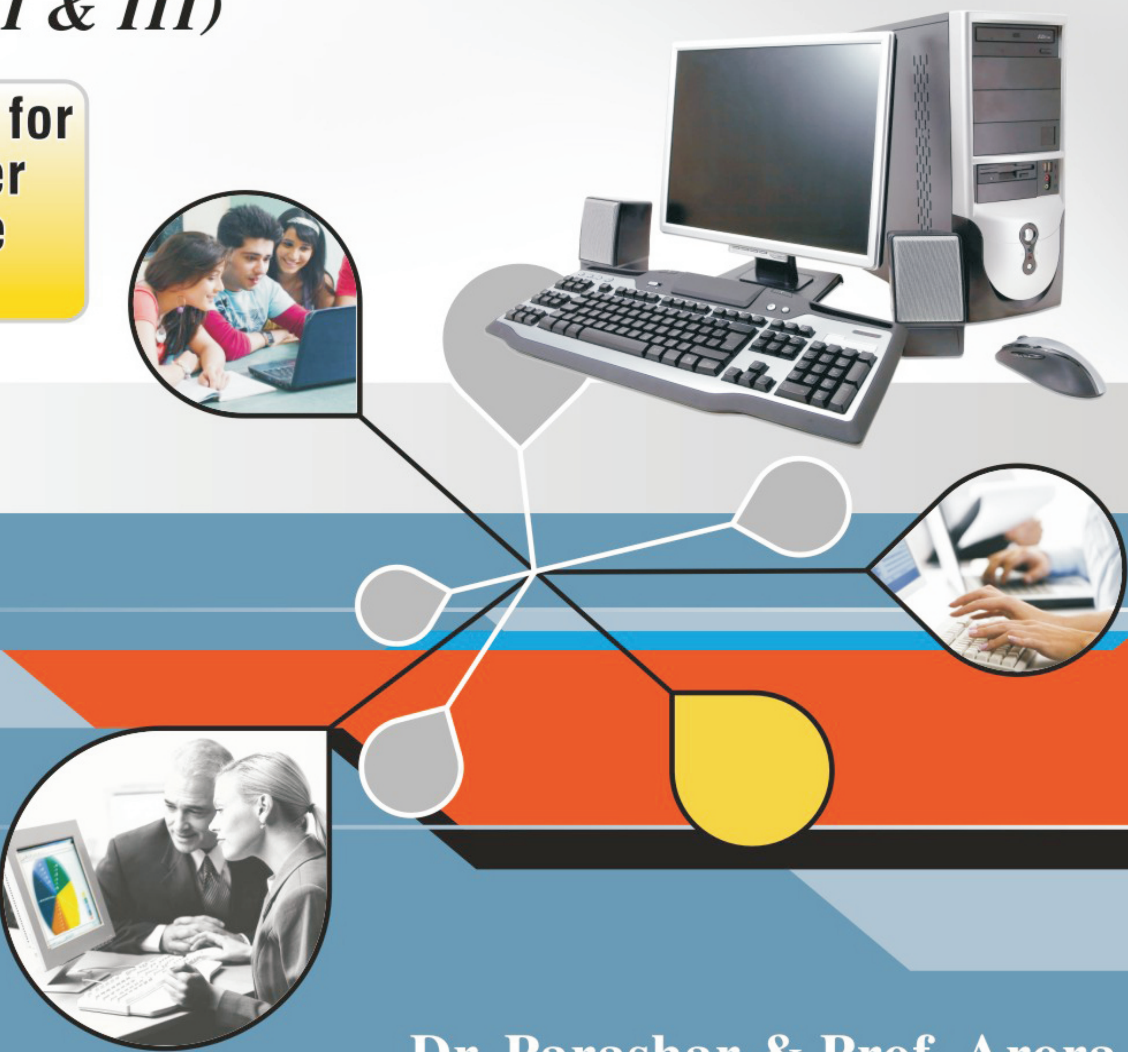

Dr. Parashar & Prof. Arora

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CONTENTS

Objective Computer Science

Discrete Structures

1. Context free grammar is—
   (A) A compiler
   (B) A language generator
   (C) A regular expression
   (D) None of these
2. The idea of an automation with a stack as auxiliary storage—
   (A) Finite automata
   (B) Pushdown automata
   (C) Deterministic automata
   (D) None of the above
3. A Pushdown automata is ……… if there is at most one transition applicable to each configuration.
   (A) Deterministic (B) Non-deterministic
   (C) Finite (D) Non-finite
4. The graphical representation of the transition of finite automata is—
   (A) Finite diagram (B) State diagram
   (C) Node diagram (D) E-R diagram
5. If two sets A and B have no common elements, *i.e.*, A ∩ B has no elements, such sets are known as—
   (A) Intersection (B) Union
   (C) Disjoint (D) Complement
6. The domain D of the relation R is defined as the—
   (A) Set of all elements of ordered pair which belongs to R
   (B) Set of all last elements of ordered pair which belongs to R
   (C) Set of all first elements of ordered pair which belongs to R
   (D) None of the above
7. 'A language is regular if and only if it is accepted by a finite automation'—
   (A) The given statement is true
   (B) The given statement is false
   (C) The given statement is partially true
   (D) Sometimes true, sometimes false
8. Which of the following does not belong to the context free grammar?
   (A) Terminal symbol
   (B) Non-terminal symbol
   (C) Start symbol
   (D) End symbol
9. A regular grammar is a—
   (A) Context free grammar
   (B) Non-context free grammar
   (C) English grammar
   (D) None of the above
10. The context free languages are closed under—
    (A) Union (B) Kleene star
    (C) Concatenation (D) All of these
11. A graph is a collection of—
    (A) Row and columns
    (B) Vertices and edges
    (C) Equations
    (D) None of these
12. The degree of any vertex of graph is—
    (A) The number of edges incident with the vertex
    (B) Number of vertex in a graph
    (C) Number of vertices adjacent to that vertex
    (D) Number of edges in a graph
13. If for some positive integer k, degree of vertex $d(v) = k$ for every vertex v of the graph G, then G is called—
    (A) K graph (B) K-regular graph
    (C) Empty graph (D) All of these
14. A graph with no edges is called as empty graph. Empty graph also known as—
    (A) Trivial graphs (B) Regular graphs
    (C) Bipartite graphs (D) None of these
15. Length of the walk of a graph is—
    (A) The number of vertices in walk W
    (B) The number of edges in walk W

(C) Total number of edges in a graph
(D) Total number of vertices in a graph

16. If the origin and terminus of a walk are same, the walk is known as—
(A) Open (B) Closed
(C) Path (D) None of these

17. A graph G is called a ……. if it is a connected acyclic graph.
(A) Cyclic graph (B) Regular graph
(C) Tree (D) Not a graph

18. Eccentricity of a vertex denoted by $e(v)$ is defined by—
(A) max $\{d(u, v): u \in v, u \neq v\}$
(where $d(u, v)$ is the distance of vertex u and vertex v).
(B) min $\{d(u, v): u \in v, u \neq v\}$
(C) Both (A) and (B)
(D) None of these

19. Radius of a graph, denoted by rad (G) is defined by—
(A) min $\{e(v) : v \in V\}$
(where $e(v)$ is eccentricity of vertex, v is a vertex and V is the vertex set)
(B) max $\{e(v): v \in V\}$
(C) max $\{d(u, v): U \in V, U \neq V\}$
(D) min $\{d(u, v): U \in V, U \neq V\}$

20. The complete graph K_n has ……… different spanning trees.
(A) n^{n-2} (B) $n \times n$
(C) n^n (D) n^2

21. A tour of G is a closed walk of graph G which includes every edge of G atleast once. A ……… tour of G is a tour which includes every edge of G exactly once.
(A) Hamiltonian (B) Planar
(C) Isomorphic (D) Euler

22. Which of the following is not a type of graph?
(A) Euler (B) Hamiltonian
(C) Tree (D) Path

23. Choose the most appropriate definition of plane graph—
(A) A graph drawn in a plane in such a way that any pair of edges meet only at their end vertices
(B) A graph drawn in a plane in such a way that if the vertex set of graph can be partitioned into two non-empty disjoint subsets X and Y in such a way that each edge of G has one end in X and one end in Y
(C) A simple graph which is isomorphic to a Hamiltonian graph
(D) None of the above

24. Match the following—

List-I

(a) Tree (b) Centre of graph
(c) Walk (d) Trivial Graph

List-II

(i) No edges
(ii) Set of all central points
(iii) No cycle
(iv) Finite sequence
(v) Set of all degrees

Codes :

	(a)	(b)	(c)	(d)
(A)	(iv)	(v)	(i)	(ii)
(B)	(iii)	(ii)	(iv)	(i)
(C)	(iii)	(ii)	(iv)	(v)
(D)	(v)	(iv)	(iii)	(ii)

25. A continuous non-intersecting curve in the plane whose origin and terminus coincide?
(A) Planar (B) Jordan
(C) Hamiltonian (D) All of these

26. Polyhedral is—
(A) A simple connected graph
(B) A plane graph
(C) A graph in which the degree of every vertex and every face is atleast 3
(D) All of the above

27. A path in graph G, which contains every vertex of G once and only once ?
(A) Eulartour (B) Hamiltonian path
(C) Eular trail (D) Hamiltonian tour

28. A minimal spanning tree of a graph G is—
(A) A spanning subgraph
(B) A tree
(C) Minimum weights
(D) All of the above

29. A tree having a main node, which has no predecessor is—
(A) Spanning tree (B) Rooted tree
(C) Weighted tree (D) None of these

30. Diameter of a graph denoted by diam (G) is defined by—
(A) max $\{e(v) : v \in V\}$
(where $e(v)$ is eccentricity of vertex, v is a vertex and V is the vertex set)
(B) max $\{d(u, v): u, v \in V\}$
(where $d(u, v)$ is the distance between two vertices U and V)
(C) Both (A) and (B)
(D) None of these

31. A vertex of a graph is called odd or even depending on whether—
(A) Total number of edges in graph is odd or even
(B) Total number of vertices in graph is odd or even
(C) Its degree is odd or even
(D) None of these

32. All the vertices of a walk except very first and very last vertex, is called—
(A) Internal vertices
(B) External vertices
(C) Intermediate vertices
(D) Adjacent vertices

33. Let A be a finite set of size n. The number of elements in the power set of A × A is—
(A) 2^{2^n} (B) 2^{n^2}
(C) $(2^n)^2$ (D) $(2^2)^n$

34. The less-than relation "<" on real number is—
(A) A partial ordering since it is symmetric and reflexive
(B) A partial ordering since it is anti-symmetric and reflexive
(C) Not a partial ordering because it not asymmetric and not reflexive
(D) Not a partial ordering because it is not antisymmetric and not reflexive

35. Let X and Y be sets with cardinalities m and n respectively. The number of one-one mapping from X to Y when $m < n$ is—
(A) m^n (B) ${}^n p_m$
(C) ${}^m C_n$ (D) ${}^n C_m$

36. Let A and B be any two arbitrary events then which one of the following is true ?
(A) $P(A \cap B) = P(A) . P(B)$
(B) $P(A \cup B) = P(A) + P(B)$
(C) $P(A|B) = P(A \cap B) . P(B)$
(D) $P(A \cup B) \leq P(A) + P(B)$

37. Probability that two randomly selected cards from a set of two red and two black cards, are of the same colour is—
(A) $\frac{1}{2}$ (B) $\frac{1}{3}$
(C) $\frac{2}{3}$ (D) None of these

38. The number of sub strings (of all lengths inclusive) that can be formed from a Character string of length n is—
(A) n (B) n^2
(C) $\frac{n(n-1)}{2}$ (D) $\frac{n(n+1)}{2}$

39. In a tree between every pair of vertices there is—
(A) n number of paths
(B) Exactly one path
(C) A self loop
(D) Two circuits

40. Suppose R be non-empty relation on a collection of sets defined by ARB if and only if $A \cap B = \emptyset$. Then—
(A) R is reflexive and transitive
(B) R is an equivalence relation
(C) R is symmetric and not transitive
(D) R is not reflexive and not transitive

41. Let P and Q be sets and P and Q denote the complements of sets P and Q. The set (P-Q) U (P-Q) U $(P \cap Q)$ is equal to—
(A) $P \cup Q$ (B) $P^c \cup C^c$
(C) $P \cap Q$ (D) $P^c \cap Q^c$

42. Let S be an infinite set and $S_1, S_2, S_3, \ldots S_n$ be sets such that $S_1 \cup S_2 \cup S_3 \cup S_4 \cup \ldots\ldots\ldots S_n = S$. Then—
(A) At least one of the sets S_i is a finite set
(B) At least one of the sets S_i is an infinite set

(C) Not more than one of the set S_i can be finite

(D) None of the above

43. Suppose A is a finite set f with n elements. The number of elements in the largest equivalence relation of A is—

(A) n (B) n^2

(C) 1 (D) $n + 1$

44. The relation R = $\{(x, y) \in N \times N \mid x^1 y\}$ is—

(A) Reflexive (B) Symmetric

(C) Antisymmetric (D) Transitive

45. The number of subset of {1, 2, ...n} with odd cardinality is—

(A) 2^n (B) n^2

(C) 2^{n-1} (D) 2^{2^n}

46. The power set 2^s of the set S = {3, {1, 4}, 5} is—

(A) {S,3,{1,4},5}

(B) {S},3,1,4,{1,3,5},{1,4,5},{3,4},Ø}

(C) {S,{3},{3,{1,4}},{3,5},Ø}

(D) None of the above

47. If P(S) denotes the power set of set S, then which of the following is always true ?

(A) P(S) ∩ P (P(S)) = {Ø}

(B) P (P(S)) =P(S)

(C) P(S) ∩ S =P(S)

(D) S □ P(S)

48. Transitive and irreflexive imply—

(A) Symmetric (B) Reflexive

(C) Irreflexive (D) Asymmetric

49. Pigenhole principle states that if A → B and |A| > |B| then—

(A) f is not onto

(B) f is not one-one

(C) f is neither one-one nor onto

(D) f may be one-one

50. Which of the following are posets—

(A) (Z, =) (B) (Z, ^{1})

(C) (Z, X) (D) (Z, X)

(Z is the set of integers).

51. A graph is planar if and only if—

(A) It does not contain subgraph homomorphic to K_5 and $K_{3, 3}$

(B) It does not contain subgraph isomorphic to K_5 and $K_{3, 3}$

(C) It contains subgraph homomorphic to K_5 and $K_{3, 3}$

(D) It contains subgraph isomorphic to K_5 and $K_{3, 3}$

52. If G is an undirected planar graph on n vertices with e edges then—

(A) $e \leq n$ (B) $e \leq 2n$

(C) $e \leq 3n$ (D) None of these

53. In an undirected graph, the number of nodes with odd degree must be—

(A) Zero (B) Even

(C) Odd (D) Prime

54. A binary tree T has n leaf nodes. The number of nodes of degree 2 in T is—

(A) log n (B) $n - 1$

(C) $2n$ (D) 2^n

55. The minimum number of edges in a connected cyclic graph on n vertices is—

(A) $n - 1$ (B) n

(C) $n + 1$ (D) None of these

56. Let G be a graph with 100 vertices numbered 1 to 100. Two vertices i and j are adjacent if $|i - j| = 8$ or $|i - j| = 12$. The number of connected components in G is—

(A) 8 (B) 4

(C) 12 (D) 25

57. What is the total number of edges in the complete graph on n vertices?

(A) n (B) ${}^nc_2$

(C) n^nc_2 (D) $\frac{n(n-1)}{2}$

58. Which of the following statement is false?

(A) A tree with n nodes has $n - 1$ edges

(B) A labeled rooted binary tree can be uniquely constructed given its post order and preorder traversal result

(C) A complete binary tree with n internal nodes has $(n + 1)$ leaves

(D) The maximum number of nodes in a binary tree of height h is $2^{h+i} - 1$

59. Consider the following statements—

S1: There exist infinite sets A, B and C such that A (B·C) is finite.

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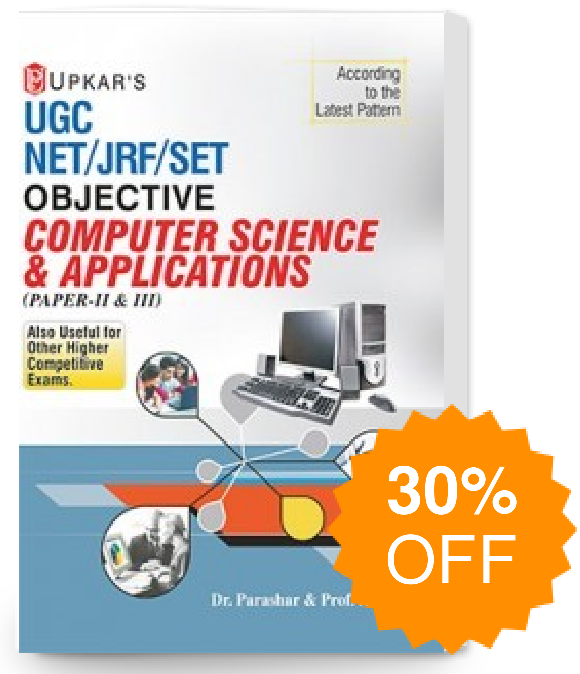

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