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Discrete Structures

Set1

Q1. The graphs in which loops and parallel edges are allowed are called:

- a) Fixed graph
- b) Parallel edge graph
- c) Trivial graph
- d) Pseudo graph

Q2. The Adjacency Matrix of a simple graph is :

- a) symmetric
- b) asymmetric
- c) polar
- d) Bipolar

Q3. _____ is defined as the pictorial representation of a relation R.

- a) Finite graph
- b) Acyclic graph
- c) Digraph
- d) Indirected graph

Q4. Let L be a lattice. Then $a \wedge b = a$ if and only if

- a) $a \vee b = b \vee a$
- b) $a \wedge b = c$
- c) $a \vee b = b$
- d) $a \vee b = b \wedge a$

Q5. Which of the following is a Redundancy law?

- a) $x.(x + y) = x$
- b) $x + (x.y) = y \wedge]x$
- c) $x.(x + y) = y$
- d) $x + x = x*y \vee x$

Q6. Minimum number of edges in an unweighted graph defines _____.

- a) **shortest path**
- b) minimum weight
- c) smaller edges
- d) None of these

Q7. Idempotent law is defined as:

- a) $a \vee b = b \vee a$
- b) $a \wedge b = b \wedge a$
- c) $a \wedge (b \wedge c) = (a \wedge b) \wedge c$
- d) **$a \vee a = a$**

Q8. _____ is defined as a matrix whose rows are rows of the unit matrix but not necessarily in the same order.

- a) directed matrix
- b) **permutation matrix**
- c) adjacency matrix
- d) Any of these

Q9. The logical expression $\{(P \wedge Q) \Rightarrow (R \wedge P)\} \Rightarrow P$ is :

- a) a tautology
- b) a contradiction
- c) **a contingency**
- d) None of these

Q10. Simplify the given Boolean expression: $PQ + PQR + PQRS + PQRST + PQRSTU$

- a) PQR
- b) $PQ + RS(TU)$
- c) **PQ**
- d) $P + Q(R+S(T+U))$

Q11. Which of the following is a declarative statement ?

- a) Close the window.
- b) It is beautiful.
- c) Two may not be a prime number .
- d) **All of these**

Q12. How many operations are required to find a minimum spanning tree of a graph with e edges using Prim's algorithm?

- a) **$O(e \log v)$**
- b) $O(v \log e)$
- c) $O(e \log e)$
- d) $O(\log e)$

Q13. Which of the following distributive laws is false for a distributive lattice?

- (i) $p \vee (q \wedge r) = (p \vee q) \wedge (p \vee r)$.
- (ii) $p \wedge (q \wedge r) = (p \wedge q) \wedge r$.
- (iii) $p \wedge (q \vee r) = (p \wedge q) \vee (p \wedge r)$.
- (iv) $p \vee (q \vee r) = (p \vee q) \vee r$

- a) (i) only
- b) (i) and (iii)
- c) (iii) only
- d) **(ii) and (iv)**

Q14. What is the complement of 4 in the lattice $D = \{1, 2, 3, 4, 6, 12\}$?

- a) 2
- b) **3**
- c) 4
- d) No complement

Q15. In a graph, a node which is not adjacent to any other node is known as:

- a) **isolated node**
- b) separated node
- c) parallel node
- d) None of these

Q26. In an examination hall 5 chairs are vacant. In how many ways can 3 students take these seats?

- a) 120
- b) 9
- c) **60**
- d) 3

Q16. What is the maximum number of edges in a bipartite graph with n vertices?

- a) n
- b) **$n^2/2$**
- c) $n/2$
- d) n^2

Q17. If a connected 6-regular planar graph has 10 vertices then what is number of regions determined by the graph?

- a) **12**
- b) 10
- c) 6
- d) 8

Q18. Which of the following statements is/are true?

- (i) A connected graph G is Euler if and only if the degree of every vertex is odd.
- (ii) An edge e of a graph G is cut edge if e is a part of any cycle in G .
- (iii) A relation on a set P is said to be partial if it is reflexive, symmetric and transitive.

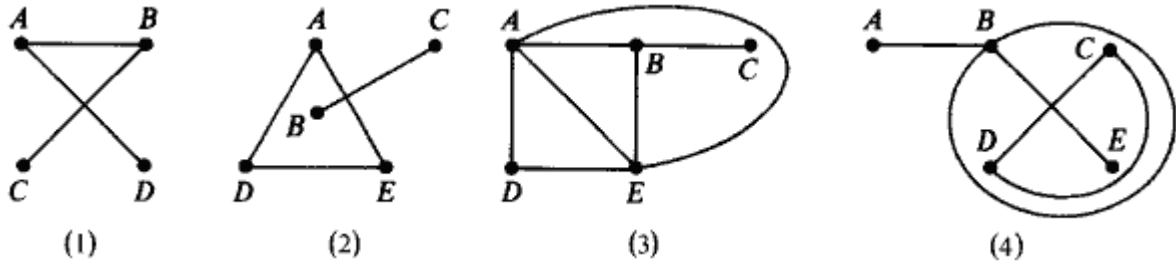
- a) Only (i)
- b) **Only (ii)**
- c) (i) and (iii)
- d) All are true

Q19. Determine the number of edges in a graph with 12 nodes, 4 of degree 0, 2 of degree 1, 1 of degree 2, 2 of degree 3 and 3 of degree 4.

- a) 22

- b) 11
- c) 12
- d) 18

Q20. Which of the following graphs is/are loop free?



- a) Only 1
- b) 4 only
- c) 1, 2 and 3
- d) 1 and 4

Q21. Which of the following is a tautology ?

- a) $x \vee y \rightarrow y \wedge z$
- b) $x \wedge y \rightarrow y \vee z$
- c) $x \vee y \rightarrow (y \rightarrow z)$
- d) $(x \rightarrow y) \rightarrow (y \rightarrow z)$

Set2

22. Dual of $p \vee (p \vee q) = p$ is :

- a) $p \vee (p \vee q) = p$
- b) $q \vee (p \vee q) = p$
- c) $p \vee (p \wedge q) = p$
- d) $p \vee (p \vee q) = p$

23. A lattice L is called _____ if every non empty sub-set of L has a least upper bound and a greatest lower bound.

- a) distributive lattice

- b) complete lattice
- c) reflexive lattice
- d) both complemented & modular lattice

Q24. The star Graph is a _____.

- a) Partial bipartite graph
- b) Complete bipartite graph
- c) Pseudo graph
- d) Multi graph

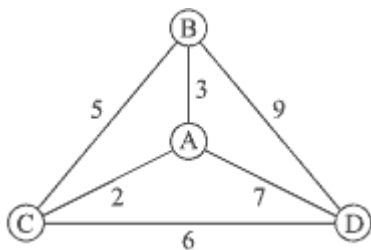
Q25. What is the maximum degree of any vertex in a simple graph with n vertices?

- a) n
- b) $n-1$
- c) $n(n-1)/2$
- d) n^2

Q26. A complete graphs with n vertices denoted by K_n has _____ edges.

- a) $n/2$
- b) $n-1$
- c) $n(n-1)/2$
- d) N

Q27. Which of the following is a possible Hamiltonian circuit in the following graph?



- a) |ABCDA|
- b) |ACDBA|
- c) |ACBDA|
- d) All of these

Q28. What will be the postorder traversal of the given list of letters?

F, G, N, A, B, I, K

- a) A, B, K, I, N, G, F
- b) B, A, K, I, N, G, F
- c) F, B, A, K, I, N, G
- d) B, A, F, K, I, N, G

Q29. Simplify the Boolean expression : $(P + Q)'(R + S + T)' + (P + Q)'$

- a) P'Q'
- b) R'S'T'
- c) R + S + T
- d) P'Q'R'S'T'

Q30. _____ is a finite graph with one vertex and no edges.

- a) Fixed graph
- b) Null edge graph
- c) Trivial graph
- d) Pseudo graph

Q31. Which of the following statements is true for adjacency matrix?

- a) Adjacency matrix for a directed multigraph must be symmetric.
- b) Adjacency matrix for a simple graph is asymmetric.
- c) Adjacency matrix for a pseudo-graph is symmetric.
- d) All of these

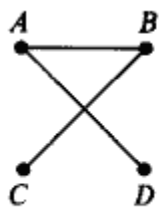
Q32. What is maximum number of edges possible in planar graph with 12 vertices?

- a) 30
- b) 36
- c) 18
- d) 15

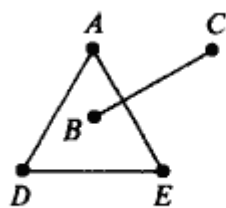
Q33. Logical Expression $(A \vee B) \rightarrow (C \vee A) \equiv 1$ is :

- a) dual of A
- b) contingency
- c) well formed formula
- d) None of these

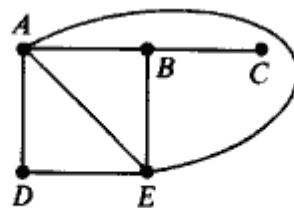
Q34. Which of the following graphs are not connected?



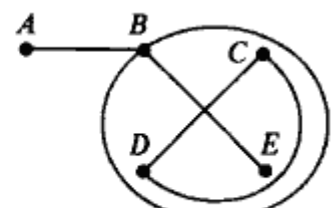
(1)



(2)



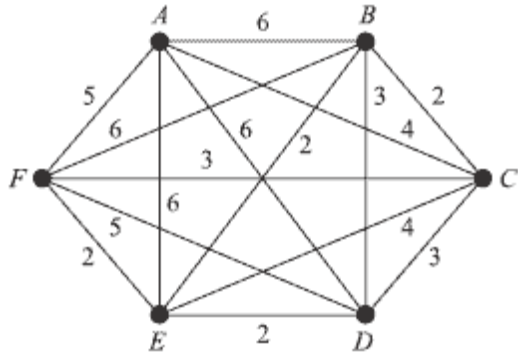
(3)



(4)

- a) Only 1
- b) 1 and 3
- c) 1,3 and 4
- d) 2 and 4

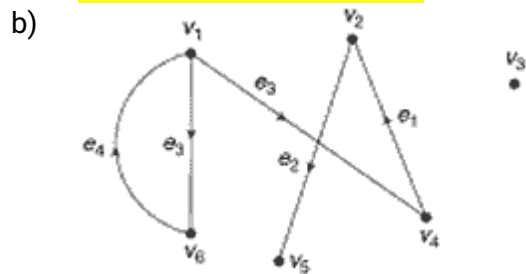
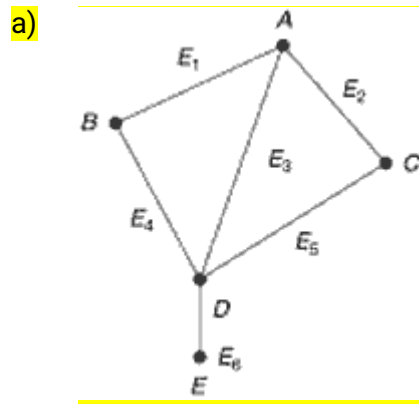
Q35. Find the path weight using nearest neighbor algorithm for the below graph starting from vertex A?



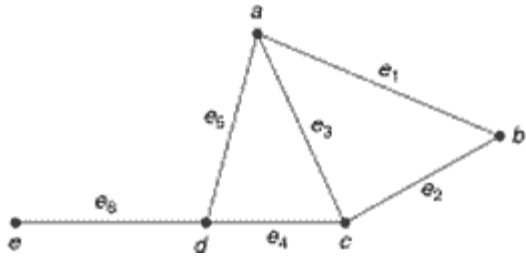
- a) 20 or 21
- b) 21 or 22
- c) 20 or 22
- d) 21 or 19

Q36. Which of the following graphs represents the below Incidence matrix?

$$\begin{bmatrix} 1 & 1 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$



c)



d)

