



Date:

Registration number:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27

BCA(DATA ANALYTICS) - I SEMESTER

SEMESTER EXAMINATION: OCTOBER 2021

(Examination conducted in January-March 2022)

BCADA 1321 – DISCRETE MATHEMATICS I

TIME- 3 HOURS

MAX MARKS-100

This question paper contains FIVE printed pages and THREE parts

PART A

Answer ALL the questions

20 X 1 = 20

1. "All triangles have three sides" is a Proposition
 - i) True
 - ii) False
2. "Bring me a glass of water" is a Proposition
 - i) True
 - ii) False
3. Negation of the Proposition $\sim p \vee q$ is
 - i) $p \wedge (\sim q)$
 - ii) $p \vee (\sim q)$
 - iii) $p \wedge q$
4. Negation of the Proposition "if all people are good then some will be happy"
 - i) All people are good and everybody will be unhappy.
 - ii) All people are good and everybody will be happy.
5. Which of the following are well-defined sets?
 - i) All the efficient doctors of the hospital
 - ii) All the hardworking teachers in a school
 - iii) All the prime numbers less than 100
6. Find the cardinal number of the following set
A = The set of letters in the word MALAYALAM
 - i) 4
 - ii) 9
7. If $B = \{3, 4, 5, 6\}$ and $C = \{2, 4, 6, 8, 10\}$; where n is total number of distinct elements in a set. Is $n(B \cup C) = n(B) + n(C) - n(B \cap C)$?
 - i) True
 - ii) False
8. Consider the relation $R = \{(a,a),(b,b),(c,c),(a,b),(b,a)\}$
 - i) R is Reflexive, symmetric, Transitive
 - ii) R is Reflexive, Symmetric but not transitive

- iii) R is Reflexive, Transitive but not Symmetric
9. If the function $g:R \rightarrow R$ where R is the set of real numbers, be defined by
 $g(x) = x^2 - 3x$ if $x \geq 2$
 $g(x) = x+2$ if $x < 2$, then $g(5)$ is
- 7
 - 10
 - 22
10. If A function $f: A \rightarrow B$ and the range $R_f = B$ then the function f is
- Bijjective
 - Injective
 - Surjective
11. What is the value of $\lim_{y \rightarrow 2} \frac{4-y^2}{2-y}$
- 2
 - 4
 - 1
12. What is the value of $\lim_{y \rightarrow 4} f(y)$? It is given that $f(y) = y^2 + 6y$ ($y \geq 2$) and $f(y) = 0$ ($y < 2$).
- 40
 - 16
 - 30
13. What is the derivative with respect to x of $(x + 1)^3 - x^3$?
- $3x + 6$
 - $3x - 3$
 - $6x - 3$
 - $6x + 3$
14. Let $A = \{-2, -1, 0, 2, 3, 4\}$. Let the function $g: A \rightarrow R$ be defined by $g(x) = x^2 \forall x \in A$. The range of A is
- $\{4, 1, 0, 9, 16\}$
 - $\{4, 1, 0, 4, 9, 16\}$
 - $\{-2, -1, 0, 2, 3, 4\}$
15. Which of the following is true?
- A graph may contain at least one vertex.
 - A graph may contain many edges and no vertices
 - A graph may contain no edges and no vertices
 - A graph may contain no vertices and many edges
16. Which of the following statements for a simple graph is correct?
- Every path is a trail
 - Every trail is a path
 - Every trail is a path as well as every path is a trail
 - Path and trail have no relation
17. In a simple graph, the number of edges is equal to twice the sum of the degrees of the vertices.

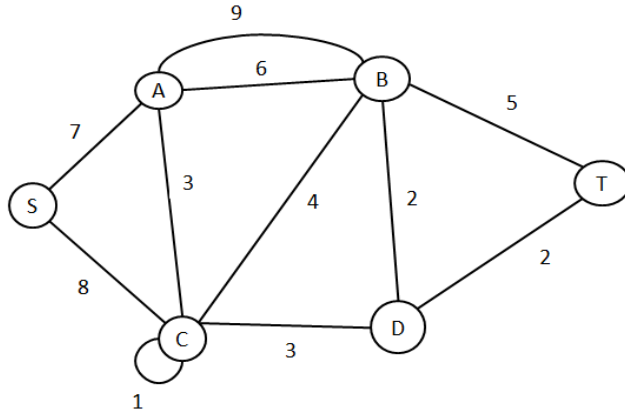
- i) True
 - ii) False
18. For a given graph G having v vertices and e edges which is connected and has no cycles, which of the following statements is true?
- i) $v=e$
 - ii) $v = e+1$
 - iii) $v = e-1$
19. Let G be a complete undirected graph on 6 vertices. If vertices of G are labeled, then the number of distinct cycles of length 4 in G is equal to
- i) 15
 - ii) 30
 - iii) 45
 - iv) 360
20. Output values of Moore type FSM are determined by its _____
- i) Input values
 - ii) Output values
 - iii) Clock input
 - iv) Current state

PART B

Answer ANY TEN Questions

10 X 5 = 50

21. Construct the truth table for $\sim[p \vee (\sim q)]$
22. Write the converse, inverse and contrapositive of the implication
“ if $x \in (A \cup B)$ then $x \in A$ or $x \in B$ ”
23. Show that $P \rightarrow (Q \rightarrow R) \leftrightarrow (P \wedge Q) \rightarrow R$ using truth table
24. In a college of 400 students, 180 students take mathematics as major subject, 160 take Physics as major subject and 150 take neither. Find how many students take both mathematics and Physics as major subjects? How many take mathematics as major but not Physics?
25. Show that the relation $R = \{(a,b) : a, b \in Z, a + b \text{ is even}\}$ is an equivalence relation.
26. Write the relation matrix for the given relation and draw the digraph of
 $A = \{1,2,3,4\}$ and $R = \{(1,2),(4,3),(2,2),(2,1),(3,1)\}$
27. Let $f: R \times R \rightarrow R \times R$ be defined by $f(x,y) = (x+y, x-y)$. Is f a Bijjective?
28. Prove that a simple graph with n vertices must be connected if it has more than $\frac{(n-1)(n-2)}{2}$ edges.
29. Find the minimum Spanning tree using Kruskal algorithm



30. Differentiate w.r.t. x

$$\left[\frac{1}{(6x-5)}\right]^{1/2}$$

31. Differentiate both sides of the following equation with respect to x

$$x^2 + y^2 - 3xy + 2x + 3y - 5 = 0$$

32. Define a Finite State Machine with an appropriate example.

PART C

Answer ANY THREE Questions

3 X 10 = 30

33. Obtain the Principal Disjunctive normal form of

$$(\sim p \wedge r) \vee (q \wedge r)$$

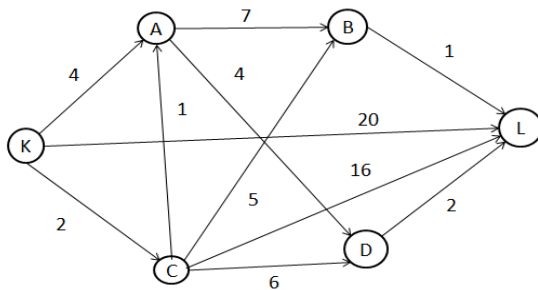
34. Let $A = \{-2, -1, 0, 2, 3, 4\}$. Let the function $g: A \rightarrow \mathbb{R}$ be defined by $g(x) = x^2 - 1 \forall x \in A$. Find the range of A.

35. If $h(x) = x + (1/x)$, $x \neq 0$, show that $h(1/x) = h(x)$

36. Differentiate the following equation w.r.t. x

$$\frac{x^2 - 3x + 5}{x^2 + 3x + 5}$$

37. Find the shortest paths between K and L in the following graph using Dijkstra's Algorithm



38. Define the states and draw a state diagram of "A coffee vending machine".