

24U171

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Name :

Reg. No :

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2024

(FYUGP)

CC24U BCA1 CJ103 - DISCRETE STRUCTURES FOR COMPUTER APPLICATIONS

(Computer Application - Major Course)

(2024 Admission - Regular)

Time: 2.0 Hours

Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

Answer *all* questions. Each question carries 3 marks.

1. Test the validity of the following argument: [Level:2] [CO1]
If two sides of a triangle are equal, then the opposite angles are equal.
Two sides of a triangle are not equal.
The opposite angles are not equal.
2. Determine whether or not $\sim (p \vee \sim p)$ is a contradiction [Level:2] [CO1]
3. Let $A = \{2, 3, 4, 5\}$. (a) Show that A is not a subset of $B = \{x \in N | x \text{ is odd}\}$. [Level:3] [CO2]
(b) Show that A is a proper subset of $C = \{1, 2, 3, \dots, 8\}$.
4. Consider the relation $R = \{(1, 1)(1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$ on the set [Level:2] [CO2]
 $A = \{1, 2, 3, 4\}$. Draw the Di-graph for this relation.
5. Define invertible function and give example. [Level:2] [CO2]
6. Provide an example of two graphs that are homeomorphic. [Level:2] [CO3]
7. Define a cycle in a graph. Illustrate with an explain. [Level:2] [CO3]
8. What is the maximum distance between any two vertices in a tree called? What is [Level:2] [CO4]
Diameter of a tree?
9. What is a binary tree? List any one property of a binary tree. [Level:2] [CO5]
10. Define degree. Draw a graph G having a vertex of degree 2 and a vertex of degree 3. [Level:2] [CO3]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

Answer *all* questions. Each question carries 6 marks.

11. (a) Simplify the boolean expression $(p \vee \sim q) \wedge \sim (p \wedge q)$. [Level:2] [CO1]
(b) Simplify the boolean expression $p \vee (p \vee q)$.

12. n denotes a positive integer less than 10. Rewrite each set using the roster form [Level:2] [CO2]
- $\{n|n \text{ is divisible by } 2\}$
 - $\{n|n \text{ is divisible by } 3\}$
 - $\{n|n \text{ is divisible by } 2 \text{ and } 3\}$
13. Consider the following relations on the set $A = \{1, 2, 3, 4\}$ and Determine which of the relations are reflexive. [Level:2] [CO2]
- $\{(1, 1)(1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$
 - $\{(1, 3), (2, 1)\}$
 - $A \times A$, the universal relation
14. Check whether the function $f(x) = 4x - 5$ is onto and one-one. [Level:2] [CO2]
15. Explain each of the following with an example: [Level:2] [CO4]
- Connected graph
 - Euler graph
 - Hamiltonian graph
16. (a) Explain chromatic number of a graph. [Level:2] [CO3]
 (b) Find the chromatic number of K_5 and C_4 .
17. (a) Define a cut set and cut vertices. [Level:2] [CO5]
 (b) Find the cut set and cut vertices in a star graph $K_{1,6}$.
 (c) Find the cut set and cut vertices in a complete graph K_6 .
18. Prove that a tree with n vertices has $n - 1$ edges. [Level:2] [CO5]

(Ceiling: 36 Marks)

Part C (Essay questions)

Answer any **one** question. The question carries 10 marks.

19. Find the truth tables for [Level:2] [CO1]
- $p \wedge \sim q$
 - $\sim p \vee \sim q$
 - $p \vee (q \vee p)$
20. (a) Draw a graph with the following vertices and edges: Vertices: A, B, C, D and edges with weights: $AB(4), AC - (1), BC - (2), BD - (5), CD - (8)$ apply Prim's algorithm starting from vertex A . List the edges included in the minimum spanning tree (MST) and calculate the total weight of the tree. [Level:3] [CO5]
- (b) Consider a graph with vertices P, Q, R, S , and T with the following edges and weights:
 $PQ - (3), PR - (1), QR - (4), QS - (2), RS - (5), ST - (6)$
 Apply Kruskal's algorithm to find the minimum spanning tree. List the edges included in the MST and compute its total weight.

(1 × 10 = 10 Marks)
