25U162 (Pages: 2) Name : ....

Reg. No : ....

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2025

(FYUGP)

(Regular/Supplementary/Improvement)

CC24UBCA1CJ103 - DISCRETE STRUCTURES FOR COMPUTER APPLICATIONS

(B.C.A. - Major Course)

(2024 Admission onwards)

Time: 2.0 Hours   Maximum: 70 Marks

Credit: 4

Part A (Short answer questions)

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

1. Define universal quantifier . Give a sentence using universal quantifier. [Level:2] [CO1]

2. State Inverse law , identity law idempotent law of logic . [Level:1] [CO1]

3. Check whether the function $f(x) = 4x - 2$ is one-one. [Level:2] [CO2]

4. Define set and give 2 example. [Level:2] [CO2]

5. Define equivalence class and give example. [Level:2] [CO2]

6. State Hand-shaking theorem. [Level:2] [CO3]

7. Define simple graph. Give an example. [Level:2] [CO3]

8. Draw a perfect balanced Binary tree with 15 vertices. [Level:2] [CO5]

9. What is a weighted graph. Give an example. [Level:2] [CO5]

10. Define the join of two graphs G_1 and G_2. Draw the join of the graphs C_5 and K_1. [Level:2] [CO3]

(Ceiling: 24 Marks)

Part B (Paragraph questions/Problem)

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

11. Show that the propositions $\sim (p \wedge q)$ $and \sim p \vee \sim q$ are logically equivalent [Level:2] [CO1]

12. Find all subsets of $S = \{a, b, c, d\}$. [Level:2] [CO2]

13. Given $f(x) = x^3$ and $g(x) = \sqrt[3]{x}$ [Level:2] [CO2]
   a) Find $f(g(x))$ and $g(f(x))$.
   b) Find $f(g(2))$ and $g(f(-1))$.

14. Consider the following relations on the set $A = \{1, 2, 3, 4\}$ and Determine which   [Level:2] [CO2]
of the relations are symmetric .

a) $\{(1, 3), (2, 1)\}$

b) The empty relation

c) $A \times A$, the universal relation

15. Explain edge subdivision, homeomorphs and homeomorphic graphs with suitable   [Level:2] [CO3]
examples.

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 tree, a pendant vertex and draw a tree with 8 vertices among which at   [Level:2] [CO4]
least 3 are pendant vertices.

b) What is eccentricity of a vertex? Calculate the eccentricity of any vertex in a C_4.

18. a) Prove that in a Tree, any two distinct vertices are connected by a unique path.   [Level:2] [CO5]

b) Prove that a tree with at least two vertices contains at least two pendant vertices.

(Ceiling: 36 Marks)

Part C (Essay questions)

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

19. Construct a truth table for each proposition.   [Level:2] [CO1]

a) $\sim p \vee \sim q$
b) $\sim (\sim p \vee q)$
c) $(p \vee q) \vee (\sim q)$

20. a) Given a graph with vertices A, B, C, D, and E with the following edges and   [Level:3] [CO5]
weights: $AB - (1), AC - (4), BC - (2), BD - (7), CE - (3), DE - (5)$. Apply
Prim's algorithm starting from vertex E. Identify the edges in the MST (Minimum
spanning tree) and calculate the total weight.

b) Consider a graph with vertices M, N, O, P, and Q and the following edges:
$MN - (1), MO - (3), NO - (4), NP - (2), OP - (5), PQ - (6)$. Apply
Kruskal's algorithm to determine the edges in the Minimum Spanning tree (MST)
and calculate the total weight.

(1 × 10 = 10 Marks)

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