22U111 (Pages: 2) Name: ....

Reg.No: ....

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2022

(CBCSS - UG)

(Regular/Supplementary/Improvement)

CC19U BCA1 C02 - DISCRETE MATHEMATICS

(Computer Application - Complementary Course)

(2019 Admission onwards)

Time : 2.00 Hours Maximum : 60 Marks

Credit : 3

Part A (Short answer questions)

Answer ***all*** questions. Each question carries 2 marks.

1. Define conjunction.
2. What you mean by a proper subset of a set ?
3. Draw the logic gate circuit for the Boolean expression $(A+B).(A+C)$.
4. What is undirected graph and give an example.
5. Define union of two graphs.
6. Draw a $3-$regular graph and $4-$regular graph.
7. Prove or disprove: The chromatic number of a wheel graph with 5 vertices is 3.
8. Define pendant vertex in a tree and draw a tree with three pendant vertices.
9. Define binary tree and path length of a tree.
10. Define rank and nullity of a graph.
11. Define nonplanar graph and give an example.
12. Define subgraph generated by a vertex set.

(Ceiling: 20 Marks)

Part B (Short essay questions - Paragraph)

Answer ***all*** questions. Each question carries 5 marks.

13. Determine whether.
    a) $[(p \vee q) \wedge (\sim q)] \rightarrow p$ is a tautology.
    b) $p \leftrightarrow \sim p$ is a contradiction.
14. Check whether the relation R on the set $\mathbb{Z}$ of integers, given by $R = \{<x, y>: \ y \text{ is divisible by } x\}$ is an equivalence relation on $\mathbb{Z}$.
15. Using truth tables, prove the De-Morgans laws in a boolean algebra.
16. Explain path, simple path and elementary path with suitable examples.

17. Frame a Travelling-Salesman problem and solve it.

18. Explain the following:

    a) Cut-set.

    b) Cut-vrttex.

    c) Edge connectivity

    d) Vertex connectivity.

    e) Separable graph.

19. Explain the following:

    a) Adjacency matrix of a graph.

    b) Boolean matrix.

    c) Strongly connected graph.

    d) Path matrix of a graph.

(Ceiling: 30 Marks)

Part C (Essay questions)

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

20. a) Verify that $p \rightarrow q \equiv \sim p \vee q$.

    b) Verify that $\sim (p \rightarrow q) \equiv p \wedge \sim q$.

    c) Verify that $\sim (\sim p \vee q) \equiv p \wedge \sim q$

    d) Show that $p \rightarrow q \equiv \sim q \rightarrow \sim p$

21. (i) Let $A = \{1, 2, 3\}$, X denotes the power set of A. Then draw the Hasse diagram for the inclusion relation on X defined by $\subseteq = \left\{ < A^{'}, A^{''} >: A^{'} \subseteq A^{''}, A^{'} \in X, A^{''} \in X \right\}$.

    (ii) Find the least member and greatest member, if any, in this poset.

    (iii) Find the minimal members and maximal members, if any, in this poset.

(1 × 10 = 10 Marks)

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