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D1BCA2203

Reg.No............................

Name: ....

FIRST SEMESTER UG DEGREE EXAMINATION, NOVEMBER 2022
(Regular/Improvement/Supplementary)

BCA

GBCA1C02T: DISCRETE MATHEMATICS

Time: 2 Hours **Maximum Marks: 60**

SECTION A: Answer the following questions. Each carries 2 marks. (Ceiling 20 Marks)

1. Write the two idempotent laws in logic.
2. What is Symmetric Relation? Give one example of a relation which is not symmetric.
3. Define greatest lower bound and least upper bound.
4. Name and define the two types of Quantifiers.
5. What is Boolean Algebra?
6. Define Eulerian graph and Hamiltonian graph.
7. Write the two idempotent laws in logic.
8. Define Regular graph. Draw a Regular graph with 5 vertices.
9. Draw a tree with 6 vertices. How many edges does it have?
10. State max-flow min-cut theorem.
11. Draw a graph with 3 vertices. Write its matrix representation.
12. Name and draw Kuratowski's two graphs.

SECTION B: Answer the following questions. Each carries 5 marks. (Ceiling 30 Marks)

13. Show the equivalence $(P \to Q) \wedge (R \to Q) \Leftrightarrow (P \vee R) \to Q$.
14. Construct the circuit that produce the output (a) $(x + y)\bar{x}$ (b) $\bar{x}(\overline{y + \bar{z}})$.
15. Prove that an unordered graph has an even number of vertices of odd degree.
16. Explain Travelling Salesman Problem.
17. How many non-isomorphic simple graphs are there with three vertices? Draw all of them.
18. Explain Breadth First Search Algorithm.
19. Show that K_5 is non planar.

SECTION C: Answer any 1 question. Each carries 10 marks.

20. (a) Verify the two De Morgan's law of sets for $A = \{1,2,3,4,5\}, B = \{2,4,6,8,10\}$ and $U = \{1,2,3,4,5,6,7,8,9,10\}$
    (b) Define partial order relation. Show that the inclusion relation $\subseteq$ is a partial ordering on the power set of a set
21. (a) Define Bipartite graph and Complete Bipartite graph. Draw one example of each one.
    (b) Prove that a full m-ary tree with i internal vertices contains $n = mi + 1$ vertices
    (c) Draw a graph with the adjacency matrix $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$

(1 × 10 = 10 Marks)