D 53633 (Pages : 2) Name...

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

FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION NOVEMBER 2023

B.C.A.

BCA 1C 02—DISCRETE MATHEMATICS

(2019—2023 Admissions)

Time : Two Hours Maximum : 60 Marks

Section A (Short Answer Type Questions)

Answer **all** *questions.*
Each question carries 2 *marks.*
Ceiling 20 *marks.*

1. Construct the truth table of $(P \vee Q) \to P$.

2. Write the symbolic representation of "if it rains today, then I buy an umbrella".

3. If R is a relation on the set $A = \{1, 2, 3, 4\}$ defined by $x \, R \, y$ if x exactly divides y. Prove that (A, R) is a poset.

4. How do you find least upper bound and greatest lower bound ?

5. Define complete bipartite graph with example.

6. Define Euler's graph.

7. Define connectivity of the graph. Give example.

8. Define spanning tree.

9. Write the definition of incidence matrix.

10. Draw the graph with the following adjacency matrix

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}.$$

Turn over

11. Show that $P \wedge \neg P$ is a contradiction.

12. If $A = \{1, 3, 5, 7, 9\}$ and $B = \{2, 3, 5, 7, 11\}$ find $A - B$, $B - A$ and $A \triangle B$.

Section B (Short Essay Type Questions)

Answer **all** *questions.*
Each question carries 5 *marks.*
Ceiling 30 *marks.*

13. Explain set operations with Venn diagram.

14. Let $A = \{1, 2, 3, 4\}$. Derive relations (R1 : reflexive, R2 : irreflexive, R3 : symmetric, R4 : antisymmetric, R5 : transitive) from A.

15. What is Hamiltonian graph ? Discuss with example.

16. Explain Depth-first search algorithm for spanning tree.

17. Define planar graphs.

18. Explain Eulerian and Hamiltonian graphs with examples, also draw the graphs of the following:

    i)   Eulerian but not Hamiltonian ; and

    ii) Hamiltonian but not Eulerian.

19. Prove that the following is an implication $(P \to (\to R)) \Rightarrow (P \to Q) \to (P \to R)$.

Section C (Essay Type Questions)

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

20. a) Define Conditional and Biconditional statements. Give example.

    b) Show that the statement $((p \Rightarrow q) \wedge (q \Rightarrow r)) \Rightarrow (p \Rightarrow r)$ is a tautology.

21. Write a note on the following :

    a) Kruskal's algorithm.

    b) Path, cycles and connectivity of a graph.

$(1 \times 10 = 10$ marks$)$