D 93901 (Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER (CBCSS—UG) DEGREE EXAMINATION
NOVEMBER 2020

B.C.A.

BCA 1C 02—DISCRETE MATHEMATICS

(2019 Admissions)

Time : Two Hours Maximum : 60 Marks

Section A (Short Answer Type Questions)

Answer at least **eight** *questions.*
Each question carries 3 *marks.*
All questions can be attended.
Overall Ceiling 24.

1. Define proposition with an example.
2. Draw the truth table of conjunction of two statements P and Q
3. Define tautology.
4. Prove that $(P \rightarrow Q) \Leftrightarrow \neg P \vee Q$.
5. Define Boolean function.
6. Define least upper bound in Poset.
7. State two forms of De-Morgan's law.
8. Define a Graph.
9. Define pendant vertex of a graph. Give an example.
10. Define path in a graph.
11. What are bipartite graphs ?
12. Write any *two* properties of a tree.

(8 × 3 = 24 marks)

Turn over

Section B (Short Essay Type Questions)

Answer at least **five** *questions.*
Each question carries 5 *marks.*
All questions can be attended.
Overall Ceiling 25.

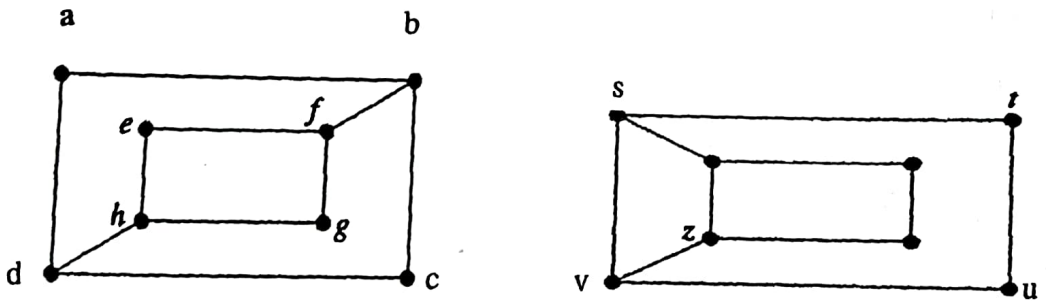
13. Show that $\neg P \wedge (\neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$.

14. Show that $(P \vee Q) \wedge \neg(\neg P \wedge (\neg(Q \vee \neg R)) \vee (\neg P \wedge \neg Q) \vee (\neg P \wedge \neg R)$ is a tautology.

15. Let X = { 1, 2, 3, 4} If R = {<x, y>/ $x - y$ is an integral non-zero multiple of 2, x & $y \in$ X} S = {<x, y>/ $x - y$ is an integral non-zero multiple of 3, x & $y \in$X}.

    Then find R, S, R $\cup$ S and R $\cap$ S.

16. Show that the following graphs are not isomorphic ?



17. For a directed tree explain the following terms with an example.

    (a) Root. (b) Leaf.

    (c) Branch node.

18. In a simple graph, the length of any elementary path is less than or equal to $n - 1$, where n is the number of nodes in the graph.

19. Show that the sum of indegrees of all the nodes of a simple digraph is equal to the sum of out degrees of all its nodes and this sum is equal to the number of edges of the graph.

(5 × 5 = 25 marks)

Section C (Essay Type Questions)

Answer any **one** *question.*
The question carries 11 *marks.*

20. Define equivalence relation. Show that the congruence relation on the set of integers is an equivalence relation.

21. (a) Define partially ordered set :

    (b) Explain Hasse Diagram.

    (c) Let X = {2, 3, 6, 12, 24, 36} and the relation $\preceq$ be such that $x \preceq y$ if x divides y. Draw the hasse diagram of poset $< X, \preceq >$.

(1 × 11 = 11 marks)