

**FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2014**

(CUCBCSS—U.G.)

Complementary Course

BCA 1C 02—DISCRETE MATHEMATICS

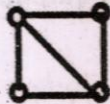
Time : Three Hours

Maximum : 80 Marks

**Part A***Answer all questions.*

1. Which are the basic logical operators ?
2. Define quantifier.
3. Define Boolean Algebra.
4. Give an example of a partially ordered set.

5. Find the degrees of all vertices of



6. Draw a regular bipartite graph.
7. Find the connectivity of  $C_4$ .
8. Find the centre of  $P_5$ .
9. Draw the dual graph of  $K_3$ .
10. Which are the *two* Kuratowski's graphs ?

(10 × 1 = 10 marks)

**Part B***Answer all questions.*

11. Construct a truth table for  $p \wedge \neg q$ .
12. Find the glb and lub of  $\{0, 1, 2, 3, \dots, 100\}$ .
13. Draw a pair of isomorphic graphs.
14. State the max flow min cut theorem for networks.
15. Draw any digraph with 5 vertices and 10 edges.

(5 × 2 = 10 marks)

**Turn over**

**Part C***Answer any five questions.*

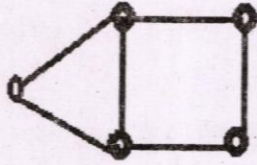
16. Define relation from a set A to a set B and describe various types of relations.
17. State De Morgan's laws for elements in Boolean Algebra.
18. Describe travelling salesman problem.
19. State Euler's formula for connected graphs. Verify it for  $K_{2,3}$ .
20. Define complete graph, chromatic graph, planar graph and directed graph.
21. Explain binary trees, rooted trees and spanning trees.
22. Prove that in a directed graph G, sum of the out degrees is same as sum of in degrees which is same as the total number of arcs[edges] in G.
23. Define Eulerian digraph. Give an example.

 $(5 \times 4 = 20 \text{ marks})$ **Part D***Answer any five questions.*

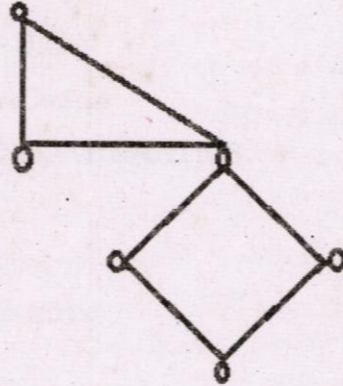
24. (a) Show that  $\neg(p \vee q) \vee \neg(p \wedge q) = \neg p$ .  
 (b) Let  $S = \{1, 2, 3\}$ . Define a relation  $R = \{(1, 1), (1, 2), (2, 3), (3, 3)\}$ . Is it an equivalence relation?
25. Explain the logic gates in detail.
26. (a) Draw the union of  $P_3$  and  $C_6$ .  
 (b) Prove that in a graph G every walk contains a path.
27. (a) Explain Hamiltonian graph and Eulerian graph. Give an example for each.  
 (b) Check whether  $K_{2,3}$ ,  $K_6$  are non planar.
28. If G is a tree with  $n$  vertices then prove that the following statements are equivalent.  
 (a) G is a connected graph having  $n - 1$  edges.  
 (b) G is a cycle free graph with  $n - 1$  edges.
29. Explain any algorithm to find a spanning tree in a graph. Using this, find the spanning tree of :



30. Find the matrix representations of the following graphs :—



(a)



(b)

31. Explain various type of connectivity in a digraph.

(5 × 8 = 40 marks)

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