

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 x 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 x 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 x 4 = 20 marks)

Part D

Answer any **five** questions.

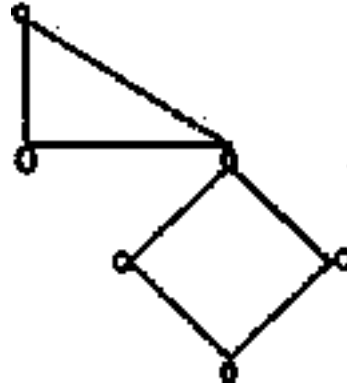
24. (a) Show that $\neg(p \vee q) \vee (\neg p \wedge q) = \neg p$.
 (b) Let $S = \{1, 2, 3\}$. Define a relation $R = \{(1, 1), (1, 2), (2, 3), (3, 3)\}$. **Is** it an equivalence relation?
25. Explain the logic gates in detail.
26. (a) Draw the union of P_3 and C_6 .
 (b) Prove that in a graph G every 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 x 8 = 40 marks)