

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2016

(CUCBCSS-UG)

Complementary Course

BCA 1C 02—DISCRETE MATHEMATICS

Time : Three Hours

Maximum : 80 Marks

Part A

*Answer all questions.**Each question carries 1 mark.*

1. Let $A = \{1, 2, 3, 4, 5\}$. Determine the truth value of $\{\exists x \in A/x + 3 = 10\}$.
2. Find x and y such that $(2x, x + y) = (6, 2)$.
3. State De Morgan's laws.
4. Can there be a Boolean algebra having 5 elements? Why?
5. Draw the union of P_3 and K_5 .
6. Is K_4 Eulerian?
7. Draw a four regular bipartite graph.
8. Draw any pair of isomorphic graphs.
9. What is the connectivity of C_7 ?
10. Find the centre of P_4 .

(10 × 1 = 10 marks)

Part B

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

11. Give an example of sets A , B and C such that $A \cap B = A \cap C$, but $B \neq C$.
12. State and prove any two properties of Boolean Algebra.
13. Let G be a connected planar graph with p vertices and q edges, $p > 2$. Then prove that $q \geq 3p - 6$.
14. Explain Hamiltonian graph.
15. Prove that in any graph the degree sum of all vertices is even.

(5 × 2 = 10 marks)

Turn over

Part C

*Answer any five questions.
Each question carries 4 marks.*

16. Discuss various relations with examples.
17. State and prove Euler's formula.
18. Explain (a) partial order relations ; (b) greatest upper bound ; and (c) least upper bound.
19. Draw a connected graph with 6 vertices and label the vertices as $a, b, c, d; e, f$ in such a way that there exists :
 - (a) $a-d$ walk which is not a path ; (b) $a-d$ path ; (c) circuit.
20. Explain travelling salesman problem.
21. Explain any algorithm using an example to find the spanning tree of a connected graph.
22. Can there be a graph with 5 vertices out of 4 vertices are of degree three and the remaining one vertex is of degree one.
23. Differentiate between the adjacency matrix and incidence matrix.

(5 × 4 = 20 marks)

Part D

*Answer any five questions.
Each question carries 8 marks.*

24. Explain various types of connectedness in digraphs.
25. Prove that the following statements are equivalent :
 - G is a tree.
 - G is connected and has $p-1$ edges.
 - G has $p-1$ edges and no cycles.
26. (a) Show that $\neg(p \wedge q)$ and $\neg p \wedge \neg q$ are logically equivalent.
(b) The set A precedes B if A is a subset of B . Then what is $A \cup B$ and $A \cap B^c$.
27. State and prove Max Flow Min Cut Theorem.
28. (a) Draw a directed graph and mark a directed path in it.
(b) Define Euler digraph and give an example.
29. Explain rooted trees and binary trees. Give examples.
30. Explain dual of a graph. Draw the dual of $K_{2,3}$.
31. Explain bipartite graph. Prove that a graph is bipartite if and only if it has no odd cycles.

(5 × 8 = 40 marks)