D 14361 **(Pages : 3)** **Name..................................**

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

FIRST SEMESTER B.Voc. DEGREE EXAMINATION, NOVEMBER 2016

Software Development

GEC 1DM 03—DISCRETE MATHEMATICS

Time : Three Hours Maximum : 80 Marks

Part A

Answer **all** *questions.*

1. Determine the truth value of the following statement, where $U = \{1, 2, 3\}$ is the universal set $\exists x \, \forall y \, x^2 < y + 1$.
2. Define an atom in a Boolean Algebra.
3. Draw the truth table of $p \wedge \neg q$.
4. Can there be a Boolean Algebra with 9 elements ? Why ?
5. What is an isolated vertex in a graph ?
6. Give an example of a 3-regular graph.
7. Find the chromatic number of P_7.
8. Draw any directed graph.
9. What is the connectivity of $K_{2,3}$.
10. Which are the Kuratowski's graphs ?

(10 × 1 = 10 marks)

Part B

Answer all **five** *questions.*

11. Let $A = \{1, 2, 3, 4\}$ and $R = \{(1, 1), (1, 2), (2, 1), (2, 2), (3, 3), (4, 4)\}$. Is R symmetric ?
12. Draw a regular connected bipartite graph.
13. Prove that in any graph there must be even number of odd vertices.

Turn over

14. Draw a planar representation of $K_{2,3}$.

15. Draw all trees with five or fewer vertices.

(5 × 2 = 10 marks)

Part C

Answer any **five** *questions.*

16. Explain equivalence relation with example.

17. State and prove DeMorgan's laws.

18. Differentiate between Hamiltonian and Eulerian graphs.

19. Draw a pair of non isomorphic graphs with the same number of vertices and edges.

20. Explain travelling salesman problem.

21. Explain any algorithm using an example to find the spanning tree of a connected graph.

22. Explain adjacency matrix and state some of its properties.

23. Write the incidence matrix of C_6.

(5 × 4 = 20 marks)

Part D

Answer any **five** *questions.*

24. $A = \{1, 2\}, B = \{a, b, c\}, C = \{c, d\}$. Find $(A \times B) \cap (A \times C)$ and $A \times (B \cap C)$. Check whether they are equal.

25. Define Boolean Algebra. State and prove any *three* of its properties.

26. For any graph G, prove that $K(G) \leq \lambda(G) \leq \delta(G)$ where $K(G)$ is the vertex connectivity, $\lambda(G)$ is the edge connectivity and $\delta(G)$ is the minimum degree.

27. Define flow, network and conservation laws. Let N be a network with the capacities $c(s, u) = 3, c(u, v) = 2, c(v, t) = 4, c(s, x) = 4, c(x, v) = 1, c(x, y) = 3, c(y, t) = 1, c(w, s) = 3,$ $c(y, w) = 2, c(w, t) = 3.$ Let f be defined as $f(s, u) = f(u, v) = f(x, y) = 3, f(v, t) = f(s, x) = 4,$ $f(w, s) = 0, f(y, w) = f(w, t) = 2.$ Can f be a flow in N ? Explain.

28. State and prove Max Flow Min Cut Theorem.

29. Find the centre of P_5 and Draw the dual of K_4.

30. (a) Show that $\neg(p \wedge q)$ and $\neg p \wedge \neg q$ are logically equivalent.

    (b) Verify Euler's formula for C_6.

31. (a) Prove that every tree is a bipartite graph.

    (b) What is a binary tree. Give an example.

(5 × 8 = 40 marks)