C 82275 (Pages : 3) Name..

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

FIRST SEMESTER B.VOC. DEGREE EXAMINATION, APRIL 2020

(CUCBCSS—UG)

Software Development

GEC 1DM 03—DISCRETE MATHEMATICS (BCA 1C02)

Time : Three Hours Maximum : 80 Marks

Part A (Objective Type)

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

1. Draw K_5.
2. Write the negation of the statement 'no student is a graduate'.
3. Give an example of two sets A and B such that $A \setminus B = \varnothing$.
4. What do you mean by a conjunction ?
5. A graph in which every vertex is of degree 2 will be a —————.
6. State Euler's formula for plane graph.
7. Define a spanning tree, give an example.
8. Give an example of a 4 regular graph.
9. Assign a truth value for the statement $5x = 20 \vee 0 > 2$.
10. Calculate the number of elements in the power set of A if $|A| = 6$.

(10 × 1 = 10 marks)

Part B (Short Answer Type)

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

11. Show that the number of vertices in a self-complimentary graph will be either a multiple of 4 or of the form $4t + 1$.
12. Give an example of a reflexive relation which is neither symmetric nor transitive.

Turn over

13. Construct the truth table for $\sim(p \vee \sim q)$.

14. Define a tree. Is tree a bipartite graph ?

15. Give an example of two non-isomorphic graph on 4 vertices.

(5 × 2 =10 marks)

Part C (Short Essay)

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

16. Prove that a tree with atleast two vertices contains atleast two pendant vertices.

17. Is $\left[(p \vee q) \Rightarrow r\right] \wedge (\sim p) \Rightarrow (q \Rightarrow r)$ a tautology ? Justify your claim.

18. State and prove a characterization theorem for cut edges in a graph.

19. Prove that a simple graph is a tree if and only if any two distinct vertices are connected by a unique path.

20. Let G be a graph in which the degree of every vertex is at least 2. Show that G contains a circuit.

21. Find number of elements in the union of A and B if $|A| = 4, |B \setminus A| = 5$. Draw the corresponding Venn diagram.

22. Show that in any group of two or more people there are always two with same number of friends in the group.

23. Illustrate boolean algebra with an example.

(5 × 4 = 20 marks)

Part D

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

24. Write short notes on (a) Network ; (b) Max-flow min-cut theorem.

25. Give a short note on Chinese postman problem.

26. Prove that a connected graph G with n vertices is a tree if and only if it has $n - 1$ edges.

27. Show that a graph has a dual if and only if it is planar.

28. Define Euler graphs and prove a necessary and sufficient condition for a connected graph to be Euler.

29. (a) Prove or disprove the formula : $|A \cup B| = |A| + |B| - |A \cap B|$.

(b) Write the conjunctive normal form of : $(q \vee (p \wedge r)) \wedge \sim ((p \vee r) \wedge q)$.

30. Prove that a graph is bipartite if and only if it contains no odd cycles.

31. Let G be a simple graph with $n \geq 3$ vertices. If for every pair of non-adjacent vertices u, v of G $d(u) + d(v) \geq n$, show that G is Hamiltonian.

(5 × 8 = 40 marks)