D 52772 (Pages : 3) Name.....

Reg. No.....

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2018

(CUCBCSS—UG)

Complementary Course

BCA 1C 02—DISCRETE MATHEMATICS

(Common for 2014 and 2017 Admissions)

Time : Three Hours Maximum : 80 Marks

Part A (Objective Type)

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

1. What do you mean by a connectives ?
2. Draw a simple graph on 4 vertices.
3. Total number of subsets of a set with 12 elements is _____
4. Write the negation of the statement 'all people are beautiful'.
5. A simple graph in which every vertex is adjacent to all the other vertices is called _____
6. State Euler's formula for plane graph.
7. Assign a truth value for the statement $5x = 20 \vee 0 > 2$.
8. Give an example of a 3 regular graph.
9. Define a tree and give an example.
10. What can you say about sets A and B if $A \cap B = \phi$.

(10 × 1 = 10 marks)

Part B (Short Answer Type)

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

11. Construct a truth table for $\sim (p \vee q)$.
12. Give an example of a relation which is reflexive and transitive but not symmetric.

Turn over

13. . Define isomorphism of two graphs.

14. Show that in any graph, the number of vertices of odd degree is even.

15. Draw K_4 as a planar graph and write the number of faces for this graph.

(5 × 2 = 10 marks)

Part C (Short Essays)

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

16. Prove that every tree is a bipartite graph.

17. Show that $[(p \vee q) \Rightarrow r] \wedge (\sim p) \Rightarrow (q \Rightarrow r)$ is a tautology without using truth tables.

18. An edge $e = xy$ of a connected graph G is cut edge of G if and only if e-belongs to no cycle of G.

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 atleast 2. Then show that G contains a circuit.

21. Find the power set of each of these sets :

(a) ϕ ; (b) $\{\phi\}$;

(c) $\{\phi, \{\phi\}\}$; (d) $\{a, b\}$.

22. If u and v are non-adjacent vertices of a tree T, then T + uv contains a unique cycles.

23. What do you mean by a boolean algebra.

(5 × 4 = 20 marks)

Part D

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

24. Prove that a simple cubic connected graph G has a cut vertex if and only if it has a cut edge.

25. Prove that a connected graph G with atleast two vertices contains atleast two vertices that are not cut-vert ices.

26. Prove that every tournament contains a directed Hamiltonian path.

27. Show that G is Euler if and only if every vertex of G is even.

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

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

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

31. (a) Write the junctive normal form of :

$$p \Rightarrow ((p \Rightarrow q) \wedge \sim (\sim p \vee \sim p)).$$

(b) Write the conjunctive normal form of :

$$(q \vee (p \wedge r)) \wedge \sim ((p \vee r) \wedge q).$$

(5 × 8 = 40 marks)