C 33337 (Pages : 2) Name.......................................

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

FIRST SEMESTER B.C.A. DEGREE EXAMINATION, NOVEMBER 2017

(CUCBCSS—UG)

Complementary Course

BCA 1C 02—DISCRETE MATHEMATICS

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 proposition ?
2. Write the negation of the statement 'all people are intelligent'.
3. If $|A| = 10$ then $|P(A)| =$ ————
4. Draw the graph $K_{3,2}$.
5. A closed path is called a ————
6. State Euler's formula for plane graph.
7. Assign a truth value for the statement $6 + 4 = 10 \wedge 0 < 2$.
8. Give an example of a 2 regular graph.
9. What do you mean by a cut vertex ?
10. What can you say about sets A and B if $A \cap B = B$

(10 × 1 = 10 marks)

Part B (Short Answer Type)

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

11. Construct a truth table for $\sim p \wedge \sim q$.
12. Give an example of a relation which is reflexive and transitive but not symmetric.
13. Define isomorphism of two graphs.

Turn over

14. Define bipartite graph.

15. What do you mean by a self complimentary graph ? Give an example.

(5 × 2 = 10 marks)

Part C (Short Essay)

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

16. Define a boolean algebra.

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

18. Prove that in a tree every vertex of degree greater than one is a cut vertex.

19. Prove that every connected graph contains a spanning tree.

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 the power set of each of these sets:

(a) ϕ; (b) $\{\phi\}$;

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

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

23. Prove that a connected graph G is a tree if and only if every edge of G is a cut edge of G.

(5 × 4 = 20 marks)

Part D

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

24. (a) Write the disjunctive normal form of : $p \Rightarrow ((p \Rightarrow q) \wedge \sim(\sim q \vee \sim p))$.

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

25. Give a short note on traveling salesman problem.

26. Prove that a connected graph G with at least two vertices contains at least two vertices that are not cut vertices.

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

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

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

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

31. If G in a simple graph such that $d(v) \geq \frac{n}{2}$ for all vertices v of G, then show that G in Hami Honian.

(5 × 8 = 40 marks)