

C 33337

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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  $|P(A)| = \text{————}$ .
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  $[(p \vee q) \Rightarrow r] \wedge (\sim p) \Rightarrow (q \Rightarrow r)$  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)  $\phi$ ;
  - (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)