

Roll No.

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F-3940**B.C.A., Part-I EXAMINATION, 2022****(NEW COURSE)****PAPER FIRST****DISCRETE MATHEMATICS****(BCA-101)***Time : Three Hours]**[Maximum Marks : 80**[Minimum Pass Marks : 27*

Note : All questions are compulsory. Attempt any two parts from each question. All questions carry equal marks.

Unit - I

1. (a) Construct truth table for the following function and check whether it is a tautology or contradiction :

$$(\neg q \Rightarrow \neg p) \wedge (q \Leftrightarrow p) \Rightarrow (p \Leftrightarrow q)$$

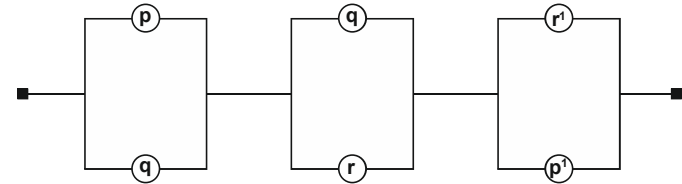
- (b) Explain quantifiers with examples.

- (c) Test the validity of the following argument :

"If the labour market is perfect then the wages of all persons in a particular employment will be equal. But it is always that case the wages for such persons are not equal therefore the labour market is not perfect."

Unit - II

2. (a) For the following mixed switching circuit:



- (i) Find the simplified circuit after simplifying the switching function.
- (ii) Verify the equivalent circuits by truth tables.
- (b) In a Boolean algebra B, prove that $x \leq y$ if and only if $x + y = y$ where $x, y \in B$.
- (c) For any two elements a and b of Boolean algebra B, Prove that:
- (i) $(a + b)' = a' \cdot b'$
- (ii) $(a \cdot b)' = a' + b'$

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Unit - III

3. (a) Prove that the number of minimal Boolean function in n -variables are 2^n .
- (b) Change the following Boolean function to disjunctive normal form :

$$f(x, y, z) = [x + (x' + y)'] \cdot [x + (y' \cdot z')'].$$

- (c) Design a 3-terminal circuit which gives the real forms to the following both functions:

$$f = xzw + y'zw, \quad g = xzw + y'zw + x'y'z$$

Unit - IV

4. (a) If A, B, C are any three non-empty sets, then prove that $(A - B) \times C = (A \times C) - (B \times C)$.
- (b) If $f : A \rightarrow B$ is one-one and onto, then prove that $f^{-1} : B \rightarrow A$ is also one-one and onto.
- (c) Show that the relation " $xRy \Leftrightarrow x - y$ is divisible by 5", where $x, y \in I$ define in the set of integers I is an equivalence relation.

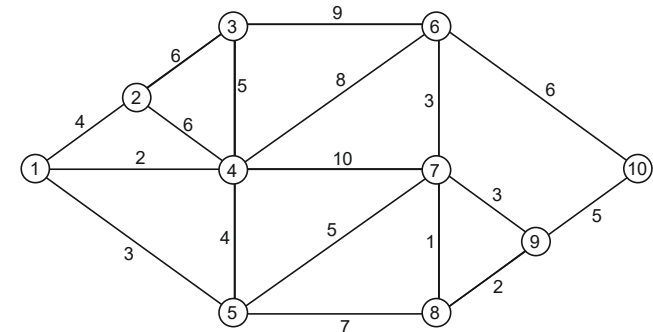
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Unit - V

5. (a) Prove that the sum of the degrees of all vertices in a graph G is equal to twice the numbers of edges in G .
- (b) Prove that an undirected graph possesses an Eulerian circuit if and only if it is connected and its vertices are all of even degree.
- (c) Determine the minimal spanning tree for the graph given below :



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