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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 :

$$(:\ q \Rightarrow :\ \mathrm{P}) \wedge (q \Leftrightarrow p) \Rightarrow (p \Leftrightarrow q)$$

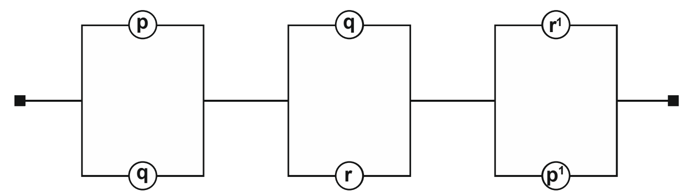
(b) Explain quantifiers with examples.

(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) $(a+b)' = a'.b'$

(ii) $(a.b)' = a'+b'$

Unit - III

3. (a) Prove that the number of minimal Boolean function in n-varriables are 2^n.

(b) Change the following Boolean function to disjunctive normal form :

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

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

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

Unit - IV

4. (a) If A, B, C are any three non-empty sets, then prove that (A – B) × C = (A × C) – (B × C).

(b) If $f : A \to B$ is one-one and onto, then prove that $f^{-1} : B \to A$ 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.

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 :