E-3881
B. C. A. (Part-I) EXAMINATION : 2021
(OLD COURSE)
Paper First
DISCRETE MATHEMATICS (101)

Time : Three Hours]   [Maximum Marks : 50

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

UNIT -1

1. a.   Establish the logically equivalence using truth table of the following proposition:

   $PV (q \wedge r) \equiv (P \vee q) \wedge (P \vee r)$

   b.   State De Morgan's law and use it to find negation of each of the following statement.
   a. Mohan is rich and happy.
   b. Shyam will run or bicycle tomorrow.
   c. Rita walks or takes the bus to class.
   d. Rahul is smart and hardworking

   c.   Let $P(x)$ be the statement "$x = x^2$". If the domain consists of integers, Explain the following statements and determine their truth valus.
   a. $P(1)$ b. $P(2)$ c. $P(-1)$ d. $\exists x \, P(x)$ e. $\forall x \, p(x)$

UNIT -2

2. a.   If $(B, +, \bullet, ')$ is a Boolean algebra, then show that following statements are equivalent -
   a. $a.b' = 0$ b. $a+b = b$

   b.   In a Boolean algebra $(B, +, \bullet, ')$ show that if $a+b = a+c$ and $ab = ac$, then $b=c$.

   c.   Draw a simpler circuit for the following diagram and verify the equivalent circuit.
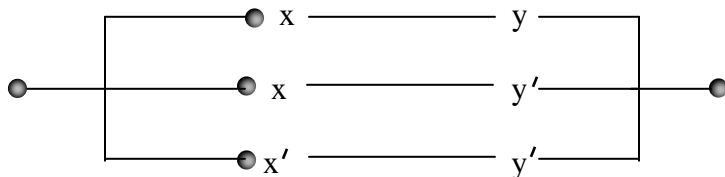
UNIT -3

3. a.   Write the function into conjuctive normal forms in three variables x, y and z : $f(x,y,z) = x$

   b.   Change the following Boolean function disjunctive normal form
   $f(x, y, z) = [x + (x' +y)'] \bullet [x+ (y' \bullet z')']$

   c.   Change the following function to conjuctive normal forms :
   $f(x, y, z) = (x+y) (x+y') x' +z)$

UNIT -4

4. a.   Show that if R_1 and R_2 be two equivalence relations on X, then $R1 \wedge R2$ is also an equivalence relation on X.

   b.   Let f be a function from X to Y. Define a relation R on X by xRy if $f(x)=f(y)$. Show that R is an equivalence relation on X.

   c.   Let $D_{20}=\{1, 2, 4, 5, 10, 20\}$, Define a relation '1' on D_{20} by x/y if x divides y. Show that '1' is a partial order relation on D_{20}.

UNIT -5

5. a.   Show that in a graph, sum of he degree of all vertices is equal to twice the number of edges.

   b.   Show that maximum number of edges in a simple graph with n vertices is $\dfrac{n(n-1)}{2}$

   c.   Define the following in a graph :
   a. degree of vertex
   b. walk
   c. path
   d. circuit
   e. planar graph

***