

Roll No.

CD-2851

B. C. A. (Part I) EXAMINATION, 2020

(Old Course)

Paper First

DISCRETE MATHEMATICS

Time : Three Hours

Maximum Marks : 50

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

Unit—I

1. (a) Prove that :

$$\sim \{p \wedge (\sim p)\}$$

is a tautology.

(b) If $P \Leftrightarrow Q$ is true, then determine the truth value of $P \vee (\sim Q)$.

(c) Write the following predicate into symbols and also write its negative in symbols :

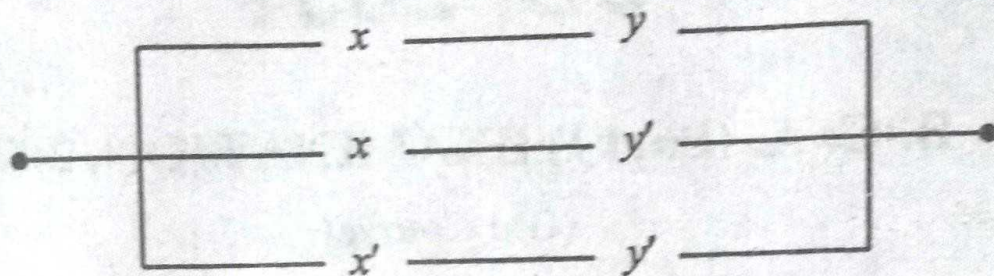
“Every rational number is a real number.”

Unit—II

2. (a) State and prove absorption laws in a Boolean algebra.

(A-45) P. T. O.

- (b) In a Boolean algebra if $a.x = b.x$ and $a.x' = b.x'$, then show that $a = b$.
- (c) Draw a simpler circuit for the following diagram and verify circuits by truth tables :



Unit—III

3. (a) Change the following functions to disjunctive normal forms of three variables :
- $x + y'$
 - $x'z + xz'$
- (b) Draw a binomial network for the following function :
- $$a.b.c' + a.b'.c + a'.b.c + a'.b'.c'$$
- (c) Draw a bridge circuit for the following function :
- $$f = (x'u + x'v's + yu + yv's)(x' + z + w' + v's)$$
- $$(y + z + w' + u).$$

Unit—IV

4. (a) If A, B, C are any three non-empty sets, then prove that :
- $$A \times (B \cap C) = (A \times B) \cap (A \times C).$$
- (b) Give an example of a relation which is reflexive but neither symmetric nor transitive.
- (c) Show that the set Q of rational numbers is countable.

[3]

Unit—V

5. (a) If a graph $G = (V, E)$ is defined by :

$$V = \{v_1, v_2, v_3, v_4, v_5\}$$

and $E = \{[v_1, v_2], [v_1, v_5], [v_2, v_3], [v_2, v_4], [v_3, v_4],$
 $[v_3, v_5], [v_4, v_5]\}$

then find the adjacency matrix and incidence matrix of G .

(b) Prove that a tree with n vertices has $(n - 1)$ edges.

(c) Find the rank and nullity of the following graph G :

