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Roll No. ....

# DD-2851

B.C.A. (Part-I)

EXAMINATION, 2021

DISCRETE MATHEMATICS

(Old Course)

Paper First

Time : Three Hours

Maximum Marks : 50

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

## Unit-1

1. (a) Are the following propositions ?

- (i) Go to Home
- (ii) May you live long.
- (iii) What is your good name ?
- (iv) Go to college.
- (v) 10 is a prime number.

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(b) Show that :

$$P \quad (q \quad r) \quad (p \wedge a) \quad r$$

(c) Negate the statement :

‘He is poor and laborious.’

## Unit-2

2. (a) Prove that the identity elements in a Boolean algebra are unique.

(b) Design the circuit for the following polynomial :

$$x \quad y(z \quad st) \quad uv$$

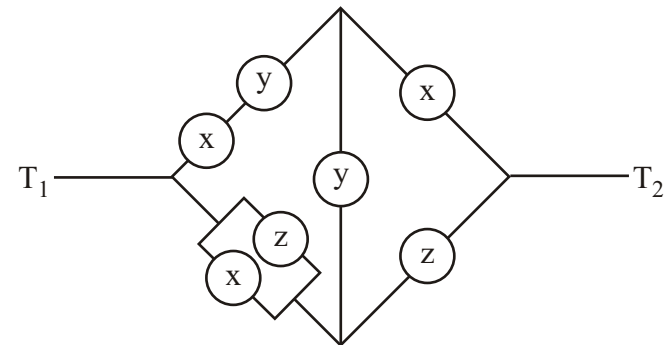
(c) Simplify the output expression :

$$(f \quad g)(f \quad h)(g \quad h)$$

## Unit-3

3. (a) Find complete disjunctive normal form in three variables and show that its value is 1.

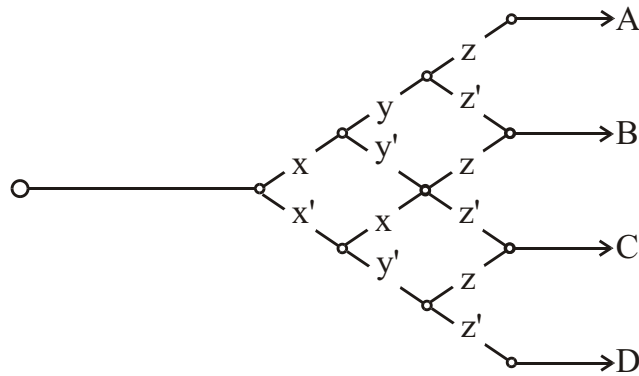
(b) Simplify the following circuit.



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- (c) A binomial net between three variables  $x, y, z$  is of the following type :



#### Unit-4

4. (a) If  $A = \{1, 2\}$ ,  $B = \{2, 3\}$  and  $C = \{3, 5\}$  then find  $(A \cap B) \cap (A \cap C)$ .
- (b) If  $R$  is an equivalence relation in the set  $A$ , then prove that  $R^{-1}$  is an equivalence relation in the set  $A$ .
- (c) Show that the union of the countable sets is countable.

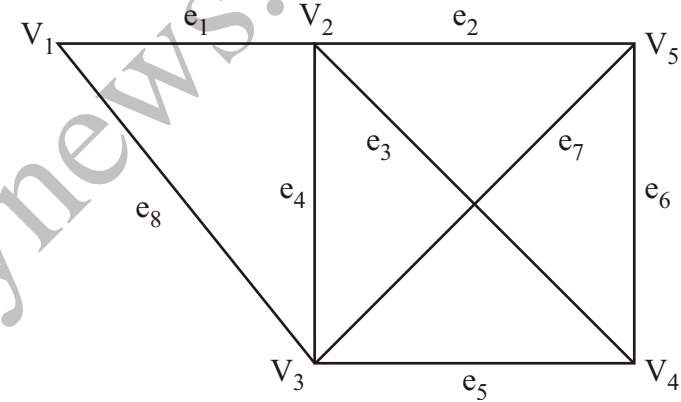
#### Unit-5

5. (a) Prove that the sum of the degrees of all vertices in a graph  $G$  is equal to twice the number of edges in  $G$ .

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- (b) Find the rank and nullity of the following graph  $G$  :



- (c) Every tree with two or more vertices is 2-chromatic.