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MCS-013

## M. C. A. (REVISED)/B. C. A. (REVISED) (MCA/BCA)

## Term-End Examination December, 2019

MCS-013: DISCRETE MATHEMATICS

Time: 2 Hours

Maximum Marks: 50

Note: Question number 1 is compulsory. Attempt any three questions from the rest.

(a) Construct the truth table for the formula: 1.

$$\alpha = (P \to (Q \to R) \to ((P \to Q) \to (P \to R))$$

Check whether it is a tautology or not. 5

- Show that  $\sqrt{2}$  is irrational. (b)
- (c) Given  $A = \{1, 3, 5, 7\}, B = \{2, 3, 5, 8\}.$ List all the elements of  $(A \cap B) \times (B - A)$ . 3
- (d) Show that the function  $f(x) = x^3$  $g(x) = x^{1/3}$  for all  $x \in \mathbb{R}$  are inverse of one another.

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- (e) Give the direct proof of the statement: 3
  "The product of two odd integers is odd."
- (f) How many license plate containing two letter followed by three digit can be formed? If the letters as well as digits can be repeated.
- 2. (a) Find the power set of:  $A = \{a, b, c, d\}.$ 
  - (b) In a group of students, 70 have a personal computer, 120 have a personal stereo and 41 have both. How many own at least one of these device? Draw an appropriate Venn diagram.
  - (c)  $^{1000}C_{98} = ^{999}C_{97} + ^{x}C_{901}$ . Find x. 4
- 3. (a) Draw logical circuit for the following logical expression:

 $x_1 \wedge x_2'$ 

(b) Find the probability of getting the sum 9 or11 in a single throw of two dice.

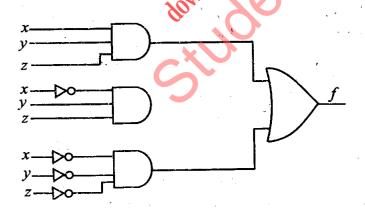
- (c) A drawer contains ten black and ten white socks. What is the least no. of socks one must pull out to be sure to get a matched pair?
- 4. (a) A problem of discrete mathematics is given to three students whose chances of solving it are  $\frac{1}{2}$ ,  $\frac{1}{3}$  and  $\frac{1}{4}$ . What is the probability that exactly one of them solves it?
  - (b) A house has 4 doors and 10 windows. In

    how many ways can a thief rob the house
    by entering through a window and exiting
    through a door?
  - (c) A committee of 2 hawkers and 3 shopkeepers is to formed from 7 hawkers and 10 shopkeepers. Find the no. of ways in which this can be done if a particular shopkeeper is included and a particular hawker is excluded.

- 5. (a) Show that 5 divides  $n^5 n$ , where n is a non-negative integer.
  - (b) Write the negation of the following statement:

"If he studies he will pass the examination."

(c) Give the output of the given circuit: 4



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