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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.*

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

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

Check whether it is a tautology or not . 5

(b) Show that $\sqrt{2}$ is irrational. 4

(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 $f(x) = x^3$ and $g(x) = x^{1/3}$ for all $x \in R$ are inverse of one another. 2

(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. 3

2. (a) Find the power set of : 2

$$A = \{a, b, c, d\}.$$

(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. 4

(c) ${}^{1000}C_{98} = {}^{999}C_{97} + {}^{x}C_{901}$. Find x. 4

3. (a) Draw logical circuit for the following logical expression : 3

$$x_1 \wedge x_2'$$

(b) Find the probability of getting the sum 9 or 11 in a single throw of two dice. 3

(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

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 ? 3

(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 ? 3

(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. 4

5. (a) Show that 5 divides $n^5 - n$, where n is a non-negative integer. 4

(b) Write the negation of the following statement : 2

"If he studies he will pass the examination."

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