89792

No. of Printed Pages : 4

MCS-013

M. C. A. (REVISED)/B. C. A. (REVISED)

Term-End Examination

June, 2019

MCS-013 : DISCRETE MATHEMATICS

Time : 2 Hours *Maximum Marks : 50*

Note : *Question No. 1 is compulsory. Attempt any three questions from the rest.*

1. (a) Obtain the truth value of the disjunction of "The earth is flat" and "3 + 5 = 2." 4

(b) Write down the truth table of $(p \to q \wedge -r) \leftrightarrow (r \oplus q)$. 4

(c) Show that $2^n > n^3$ for $n \geq 10$. 4

(d) Design a logic circuit capable of operating a central light bulb in a hall by three switches x_1, x_2, x_3 (say) placed at the three entrances to that hall. 4

(e) If $X = \{a, b, c\}$ and $Y = \{1, 2, 3\}$, find $X \times X$ and $X \times Y$. 4

2. (a) Suppose 10 people have exactly the same briefcase, which they leave at a counter. The briefcases are handed back to the people randomly. What is the probability that no one gets the right briefcase ? 5

(b) What is a function ? Explain the following types of functions with example : 5

(i) Bijective

(ii) Surjective

3. (a) Show that : 5

$$(p \to \sim q) \wedge (p \to \sim r) \equiv \sim [p \wedge (q \vee r)].$$

(b) Prove that $(x \vee y)' = x' \wedge y'$ and $(x \wedge y)' = x' \vee y'$. 5

4. (a) Let $f : B^2 \to B$ be a function which is defined by : 5

$$f(0,0) = 1, f(1,0) = 0,$$

$$f(0,1) = 1, f(1,1) = 1$$

Find the Boolean expression specifying the function f.

(b) Give the expression

$$\left(x_1' \vee \left(x_2 \wedge x_3'\right)\right) \wedge \left(x_2 \vee x_4'\right),$$

find the corresponding circuit, where $x_i \ (1 \le i \le 4)$ are assumed to be inputs to the circuitary. 5

5. (a) There is a village that consists of two types of people–those who always tell the truth and those who always lie. Suppose that you

visit the village and two villagers A and B come up to you. Further suppose :

A says, "B always tells the truth" and B says, "A and I are of opposite types." What types are A and B ? 5

(b) Draw a Venn diagram to represent the following : 5

(i) $(A \cup B) \cap (A \sim C)$

(ii) $(A \cup B) \cap C$