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MCS-013

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

Term-End Examination

June, 2023

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) Differentiate between predicate logic and propositional logic. Give suitable example to show the difference. 4

   (b) Show that : 4

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

   without using truth table.

   (c) Show whether $\sqrt{5}$ is irrational or rational. 4

   (d) Construct the logic circuit represented by the Boolean expression : 4

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

   where x_1, x_2, x_3, x_4 are inputs to the circuit.

   (e) Find $f^{-1}(x)$, where $f(x) = \dfrac{x-2}{x-3}$. 4

2. (a) How many ways are there to rank n candidates for the job of a chef ? In how many rankings will Mr. X be in the second place ? 4

   (b) Prove that : 4

   $$C(n, r) + C(n, r-1) = C(n+1, r)$$

   (c) State Absorption Law and Involution Law of Boolean Algebra. 2

3. (a) Explain the difference between a pair of mutually exclusive events and a pair of independent events. Your explanation should include an example for each. 5

(b) In how many ways can 15 students of MCA and 10 students of BCA be groped into 4 groups ? 3

(c) Let A = {1, 2, 3, 4, 5}. Construct a relation R from A to A such that R is reflexive and symmetric but not transitive. 2

4. (a) A sequence of ten bits (0's and 1's) is randomly generated. What is the probability that at least one of the bits is 0 ? 3

(b) Find the number of permutations of the word ATTENDANT. 3

(c) One red and one white dice are rolled. What is the probability that the red die turns up a smaller number than the white die ? 4

5. (a) Make Venn diagram for each of the situations given below : 4

(i) $A \subseteq B$

(ii) $A \cap B = \phi$

(b) Let $f(x) = \sqrt{x+1}$, $\forall x \geq -1$ and $g(x) = x^3$, $\forall x \in R$, then find f o g and g o f. 2

(c) Suppose a valid computer password consists of 8 characters, the first of which is the digit 1, 3 or 5. The rest of the 7 characters are either English alphabets or a digit. How many different passwords are possible ? 4