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MCS-013

MCA (Revised) / BCA (Revised)

Term-End Examination

February, 2021

MCS-013 : DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

Note : *Question no. **1** is **compulsory**. Answer any **three** questions from the rest.*

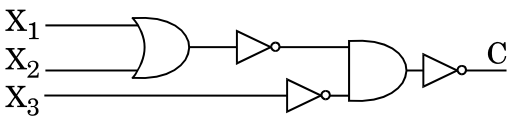
1. (a) Show using truth table whether $(p \wedge q \wedge r)$ and $(p \vee r) \wedge (q \vee r)$ are equivalent or not. *3*

(b) Using Mathematical Induction, prove that : $1 + 2 + 3 + \ldots + n = \frac{n(n+1)}{2}$. *4*

(c) Prove that if A is a set with n elements, then $|P(A)| = 2^n$. *3*

(d) If there are 7 men and 5 women, how many circular arrangements are possible in which women do not sit adjacent to each other ? *3*

(e) Find Boolean expression for the following logic circuit : 3



(f) If $f : R \to R$ be a function given by $f(x) = x^3 - 2$, find whether f^{-1} exists or not. If f^{-1} exists, find it. 4

2. (a) How many words can be formed using the letters of the word "DEPARTMENT", if each letter must be used at most once ? 4

(b) Give geometric representation for $\{1, 3\} \times \{-2, 3\}$. 2

(c) Show that $(p \to q) \to q = p \vee q$. 2

(d) Find the number of ways to distribute 20 distinct objects into 10 distinct boxes with at least 4 boxes remaining empty. 2

3. (a) Draw Venn diagrams for the following expressions : *3*

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

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

(iii) $A \cap B \cap C$

(b) Draw logic circuit for the following Boolean expression : *2*

$$(X_1 \wedge X_2') \vee (X_1' \wedge X_2')$$

(c) Write the following statements in the symbolic form : *2*

(i) Every thing is correct.

(ii) All birds can not fly.

(d) Explain Principle of Duality with the help of an example. *3*

4. (a) Show that $\sqrt{11}$ is irrational. *4*

(b) What is an indirect proof ? Explain with the help of an example. *3*

(c) Explain De Morgan's Laws with the help of Venn diagram. *3*

5. (a) In a ten-question true-false exam, a student must achieve five correct answers to pass. If he selects his answers randomly, what is the probability that he will pass ? *3*

(b) In how many ways can an employer distribute 50 twenty-rupee notes among 5 employees so that each gets at least one note ? *2*

(c) Show that in any group of 30 people, you can always find 5 people who were born on the same day of the week. *3*

(d) Draw truth table for : *2*

$$(p \rightarrow q) \rightarrow p$$