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**MCS-013**

04039

# MCA (Revised)

## Term-End Examination

## June, 2011

## MCS-013 : DISCRETE MATHEMATICS

*Time : 2 hours* *Maximum Marks : 50*

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

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**1.** (a) It is required to sit 5 men and 4 women in a row so that the women occupy the even places. How many such arrangements are possible ? **3**

(b) A question paper of discrete mathematics has two sections of five questions each. In how many ways can an examinee answer six questions taking at least two questions from each group ? **4**

(c) If A and B are sets, prove that. **3**

$A \cup B = (A - B) \cup B$

(d) Find $f^{-1}(x)$ where $f(x) = \frac{x + 4}{x - 3}$ **3**

(e) Show that; $\sim (PV (\sim P \wedge Q)) \equiv \sim P \wedge \sim Q$ **3**
using logical equivalent formulas.

(f) What is pigeon hole principle ? Using this principle show that in any group of 36 people, we can always find 6 people who were born on the same day of week. 4

2. (a) Express the Boolean expression in three variables $(x+y+z)\ (xy+\ x'z)'$ in DNF 4

(b) Use mathematical induction method, prove that : 3

$$1+2+3+\_\_\_\_\_+n\ =\frac{n(n+\ 1)}{2}$$

(c) Prove that a relation R in the set Z of integers defined by 'aRb $\Leftrightarrow$ a − b is even' is an equivalence relation. 3

3. (a) Prove that $(P\Rightarrow q)\ \forall r\equiv(P\forall r)\Rightarrow(q\forall r)$ 3

(b) If $f : R\rightarrow R$ is a function such that $f(x)=3x+5$ 4

prove that $f$ is one - one onto. Also find the inverse of $f$.

(c) Determine the number of integer solutions to the equation $x_1+x_2+x_3+x_4=7$ where $xi \geq 0\ \forall i=1,2,3,4$ 3

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

(b) What is duality principle ? Find dual of $(A \cup B) \wedge C$ 3

(c) Verify that $p \wedge q \wedge \sim p$ is a contradiction and $p \rightarrow q \Leftrightarrow \sim p \vee q$ is a tautology. 3

5. (a) Show that $\sqrt{3}$ is irrational 4

(b) Construct the logic circuit and obtain the logic table for the expression $x_1 \vee (x'_2 \wedge x'_3)$ 3

(c) How many numbers are there between 100 and 1000 such that 7 is in the unit's place ? 3