07117

MCA (Revised)

Term-End Examination

June, 2012

MCS-013 : DISCRETE MATHEMATICS

Time : 2 hours *Maximum Marks : 50*

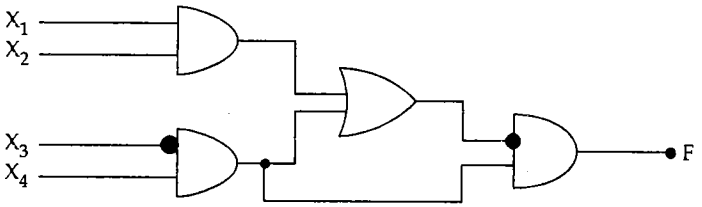
Note : *Q. No. **1** is **compulsory**.*
*Attempt **any three** from the rest.*

1. (a) Show that $pV\sim (p\wedge q)$ is a tautology. **3**

(b) Prove the following equivalence **3**
$\sim \forall x\ P(x) \equiv \exists x \sim P(x)$

(c) Use principle of mathematical induction to prove that $n^3 - n$ is divisible by 3. **3**

(d) Write the output of following circuit. **3**



(e) Let R be a relation on the set $A = \{1, 2, 3, 4\}$ such that aRb if and only if $a + b > 5$. Check if R is reflexive, symmetric, transitive. **3**

(f) How many permutations are there for the word ASSOCIATION ? 2

(g) Three coins are tossed and number of heads are observed. Find the probability that 3

(i) at least one head appears

(ii) all heads or all tails appear.

2. (a) Prove De Morgan's laws using truth table. 3

(b) Present a Direct proof of the statement. "Square of an odd integer is odd". 3

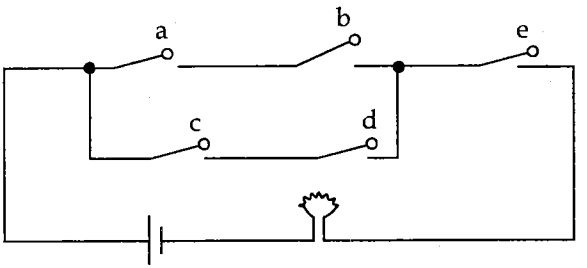
(c) Explain : 4

(i) Proof by contrapositive

(ii) Proof by contradiction

with the help of suitable examples.

3. (a) Write boolean equation for the following circuit. 4



(b) Reduce the following boolean equation to simplest form. 3

$(a \wedge b' \wedge c) \vee (a \wedge b' \wedge c') \vee (a' \wedge b \wedge c') \vee (a' \wedge b' \wedge c')$

(c) Write a short note on "Principal of Duality". 3

4. (a) Let A, B and C be three sets such that $A \cup B = A \cup C$. Does it imply $B = C$? Support your answer by suitable example. **2**

(b) Prove $A \times (B \cup C) = (A \times B) \cup (A \times C)$ **3**

(c) Let $f(x) = x^2$ and $g(x) = x + 7$ **2**

Find fog (x) and gof (x).

(d) Let A be the set of natural nos. 1, 2, 3, 4...., Let R be a relation on A such that aRb if and only if a mod 5 = b mod 5. Prove that R is equivalence relation. **3**

5. (a) In how many ways can a party of 9 people arrange themselves around a circular table ? **3**

(b) What is the sum of coefficients of all the terms in the expansion of $(a + b + c)^5$? **3**

(c) In how many ways r distinct objects can be distributed into 5 different boxes with at least one box empty ? **4**