

MCA(Revised)
Term-End Examination
December, 2013

MCS-013 : DISCRETE MATHEMATICS

Time : 2 hours

Maximum Marks : 50

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

1. (a) In how many ways 100 voters can vote for three candidates standing for the election of the post of president of their association ? 3
- (b) How many five different letter words can be formed out of the word "LOGARITHMS" ? 3
- (c) Prove that $(A \cup B)' = A' \cap B'$. 4
- (d) Let $A = \{1, 2, 3, 4, 5\}$ and define R on A by xRy if $x+1=y$. Find : 3
 - (i) R (ii) R^2 (iii) R^3
- (e) Construct a truth table for the given proposition $(7p \Leftrightarrow 7q) \Leftrightarrow (q \Leftrightarrow r)$ 3
- (f) Find the dual of $(x \cdot \perp) + (x \cdot y) + (y \cdot z) + (z \cdot 0)$ 4

2. (a) Show that $((p \rightarrow q) \rightarrow q) \rightarrow (p \vee q)$ is a tautology. 3
- (b) Use mathematical induction method to prove that $n^3 + 2n$ is divisible by 3 for $n \geq 1$. 4
- (c) If $f : A \rightarrow B$ such that $f(x) = x - 1$ and $g : B \rightarrow C$ such that $g(y) = y^2$ find $f \circ g(y)$. 3

3. (a) Let R be a relation in the set of all lines in a plane defined by aRb if line 'a' is parallel to line 'b'. Then prove that R is an equivalence relation. 4
- (b) Find n if $p(n, 4) = 42 p(n, 2)$. 3
- (c) Express the Boolean expression in three variables $(x + y + z)(xy + x'z)'$ in DNF. 3
4. (a) Construct a logic circuit by minimizing the Boolean function 5
- $$f(x, y, z) = xyz + x\bar{y}z + \bar{x}\bar{y}z + \bar{x}y$$
- (b) If there are 12 persons in a party and if each two of them shake hands with each other, how many hand shakes happen in the party? 5
5. (a) What is the minimum number of students required in a particular class to be sure that atleast six students will receive the same division if there are five possible divisions. 4
- (b) Find the dual of $(A \cap B)' \cap C$. 3
- (c) Show that $p \rightarrow q = \neg q \rightarrow \neg p$. 3
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