

**MCA (Revised)**  
**Term-End Examination**  
**June, 2008**

**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) The chairs of an auditorium are to be labelled with a letter from the English alphabet {A, B, ..., Z} and a positive integer not exceeding 100. What is the largest number of chairs that can be labelled differently? 3
- (b) If  $R = \{(1, 1), (2, 1), (3, 2), (4, 3)\}$ , find  $R^2, R^4$ . 2
- (c) How many bit strings of length 10 contain at least four 1's? 3
- (d) Show that  $\neg(q \rightarrow r) \wedge r \wedge (p \rightarrow q)$  is a contradiction. 3
- (e) Draw the logic circuit for the boolean function  
$$Y = AB' + (A + B)' + (A' B)'$$
 3
- (f) Write down all the partitions of 6. Also find  $P_6^3$  and  $P_6^4$ . 3
- (g) Let  $Q(x, y)$  denote " $x + y = 0$ ". What are the truth values of the quantification  $\exists y \forall x Q(x, y)$ ? 3

2. (a) Find the number of integers between 1 and 250 both inclusive that are not divisible by any of the integers 2, 3, 5 and 7. 6
- (b) From a club consisting of 6 men and 7 women, in how many ways can we select a committee of 4 persons that has at most one man? 4
3. (a) Show that  $p \vee (q \wedge r)$  and  $(p \vee q) \wedge (p \vee r)$  are logically equivalent. 3
- (b) Prove, by mathematical induction, that
- $$\frac{1}{1.2} + \frac{1}{2.3} + \frac{1}{3.4} + \dots + \frac{1}{n(n+1)} = \frac{n}{n+1}$$
- 4
- (c) How many permutations are there of the letters, taken all at a time, of the word ALLAHABAD? 3
4. (a) Let  $A = \{0, 1, 2, 3 \dots\}$  and  $R = \{(x, y) : x - y = 3k, k \text{ is an integer}\}$  i.e.,  $x R y$  iff  $x - y$  is divisible by 3, then prove that  $R$  is an equivalence relation. 3
- (b) A car manufacturer has 5 service centres in a city. 10 identical cars were served in these centres for a particular mechanical defect. In how many ways could the cars have been distributed at various centres? 4
- (c) Write the CNF of the function
- $$(xy' + xz)' + x'$$
- 3

5. (a) Prove that  $\sqrt{7}$  is irrational. 4
- (b) Check whether the following argument is valid :  
 $((p \rightarrow q) \wedge (q \rightarrow r)) \Rightarrow (p \rightarrow r)$  3
- (c) Suppose A and B are mutually exclusive events such that  $P(A) = 0.3$  and  $P(B) = 0.4$ . What is the probability that 3
- (i) A does not occur ?
- (ii) A or B occurs ?