MCA (Revised)

Term-End Examination

December, 2009

08314

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) If a five digit number is chosen at random, what is the probability that the product of the digits is 20 ? **3**

(b) If the function $f : R \to R$ is defined by $f(x) = x^2$. Find $f^{-1}(4)$ and $f^{-1}(-4)$. **4**

(c) In how many ways can a prize winner choose any 3 CDs from the 'Ten Best' list ? **3**

(d) Let $A = \{a, b\}$ be a given set and $R = \{(a, a), (b, a), (b, b)\}$ and $S = \{(a, b), (b, a), (b, b)\}$ be relations on A. Then verify $(SoR)^{-1} = R^{-1} \text{ o } S^{-1}$. **3**

(e) Find contrapositve of : **3**

(i) If John is a poet then he is poor.

(ii) Only if Marc studies will he pass the test.

(f) Show that $2^n > n^3$ for $n \geq 10$. **4**

2. (a) Construct the logic circuit for $x_1' \wedge (x_2 \vee x_3')$. 3

(b) What is the sum of the coefficients of all the terms in expansion of $(a+b+c)^7$? 3

(c) Show that the relation 'equality' defined in any set A is an equivalence relation. 4

3. (a) Find CNF form of $\neg (P \vee Q) \leftrightarrow P \wedge Q$. 4

(b) Establish the equivalence for $P \rightarrow (Q \rightarrow R) \equiv (P \wedge Q) \rightarrow R$. 3

(c) Show that if any 20 people are selected, then we may choose a subset of 3 so that all 3 were born on the same day of the week ? 3

4. (a) Use induction to prove that any integer $n \geq 2$ is either a prime or a product of primes. 4

(b) Given the set $A = \{1, 2, 3\}$, consider a relation in A : $R = \{(1, 1), (2, 2), (2, 3), (3, 2)\}$. Find RoR. 3

(c) In how many ways can 12 balloons be distributed at a Birthday party among 10 children ? 3

5. (a) Among the integers 1 to 200 find the number of integers that are 4

(i) divisible by 2 or 5 or 9.

(ii) not divisible by 5.

(b) Determine the number of integer solutions to the equation $x_1 + x_2 + x_3 + x_4 = 7$, where $x_i \geq 0$ for all $i = 1, 2, 3, 4$. 3

(c) Find the number of ways of placing n people in $n-1$ rooms, no room being empty. 3

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