

00254

MCA (Revised)
Term-End Examination
June, 2010

MCS-013 : DISCRETE MATHEMATICS

Time : 2 hours

Maximum Marks : 50

Note : Question No. 1 is compulsory. Attempt any three questions from the rest.

1. (a) Show that 2

$$\sim(A \cap B) = \sim A \cup \sim B$$

- (b) In how many ways can three examinations 3
 be scheduled within a five - day period so
 that no two examinations are scheduled on
 the same day.

- (c) Using principle of Mathematical Induction or 3
 otherwise, prove that

$$1^2 + 3^2 + 5^2 + \dots + (2n - 1)^2 = \frac{n(2n - 1)(2n + 1)}{3}$$

- (d) Construct the truth table for following : 6

$$(p \rightarrow q) \leftrightarrow (\bar{p} \vee q)$$

- (e) Consider a set $X = \{2, 3, 4\}$ and the Relation defined on X by.
 $R = \{(2, 2) (2, 3) (3, 3) (3, 4) (2, 4) (4, 4)\}$.
 Find whether R is :
 (i) Reflexive
 (ii) Symmetric
 (iii) Transitive
 Justify your answer
- (f) Construct the logic circuit for expression $(y_1 \vee y_2) \wedge (y_3 \wedge y_4)'$. 3
2. (a) (i) Calculate $S_3^2 + S_4^2$. 4
 where 'S' Denotes Stirling Number of the second kind.
- (ii) Verify that $[(p \wedge q) \wedge \sim p]$ is contradiction. 4
- (b) If $A = \{1, 2, 3, 4, 5\}$ $B = \{3, 5, 6, 7\}$ Then 2
 Find $A \Delta B$.
3. (a) A survey among the students of college. 6
 65 Study Hindi, 45 study Spanish, and 42 study Japanese, Further 20 study Hindi and Spanish, 25 study Hindi and Japanese, 15 study Spanish and Japanese and 8 study all the languages.
- (i) How many students are studying at least, one language ?
 (ii) How many students are studying only Hindi.

(b) If $f = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 1 & 3 & 4 & 2 \end{bmatrix}$ $g = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 3 & 4 & 1 \end{bmatrix}$ 4

$$h = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 4 & 2 & 1 & 3 \end{bmatrix}$$

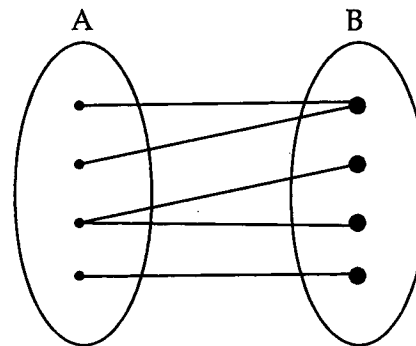
be permutation on $A = \{1, 2, 3, 4, 5\}$. Then find $(f \circ g) \circ h$.

4. (a) Show that $n^3 + 2n$ is divisible by 3 for all $n \geq 1$ by induction. 4

(b) If $A = \mathbb{R} - \{3\}$ and $B = \mathbb{R} - \{1\}$ and function $f : A \rightarrow B$ is defined by $f(x) = \frac{x-2}{x-3}$. 3

Show that 'f' is Invertible and find its Inverse.

(c) Look at following figure. Is it a function? 3
Why/why not?



5. (a) In the Binomial Expansion $\left(3x - \frac{1}{3x}\right)^8$ 5
Find the Term Independent of 'x'.
- (b) Suppose we have seven rooms and want to assign four of them to four programmers as offices and use the remaining three rooms for computer terminals. In how many ways this can be done. 3
- (c) Define relation mathematically. 2
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