Subject : Mathematical Foundations

Day : Monday	Time : 10.00 AM TO 1.00 PM
Date : 13/06/2016	Max Marks : 80 Total Pages : 2

S.D.E. **30132**

N.B.:

1) Attempt **ANY THREE** questions from Section – I and attempt **ANY TWO** questions from Section - II.

2) Answers to both the sections should be written in the **SAME** answer book.

3) Figures to the right indicate **FULL** marks.

SECTION - I

Q.1 **a)** If U is universal set and   [08]
U = {x | x ∈ N, x≤ 14}, A = {2, 4, 6, 8, 10, 12},
B = { 1, 3, 5, 7, 9, 10, 11, 12, 13},
find: **i)** $n(A \cup B)$ **ii)** $n(A \cup B)$ **iii)** $n(A' \cup B')$ **iv)** $n(A \cup A')$

b) If $f(x) = x^2 - 2x + 3$ and $g(x) = 2x - 3$,   [08]
find: **i)** fog   **ii)** fog^{-1}.

Q.2 **a)** Write truth tables for at least four logical connectives.   [08]

b) Check whether the three points A(1, -2, 3), B(2, 3, -4) and C(0, -7, 10) are   [08]
collinear by using vectors.

Q.3 **a)** Write a note on Eucledian algorithm. Explain it with one example.   [08]

b) Find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{bmatrix}$.   [08]

Q.4 **a)** Write a short note on: Complexity of algorithm.   [08]

b) If A = {2, 3, 4, 5, 6}, determine the truth value of each of the following   [08]
statements:
i) $\exists x \in A$, such that $x + 3 = 10$
ii) $\forall x \in A$, $x + 2 < 11$
iii) $\exists x \in A$, such that $x + 2 < 5$
iv) $\forall x \in A$, $x + 3 \geq 9$

Q.5 **a)** By using mathematical induction, prove that $1 + 2 + 3 + \ldots + n = \dfrac{n(n+1)}{2}$.   [08]

b) Explain ordered and unordered partitions.   [08]

P.T.O.

SECTION - II

Q.6 **a)** Find the number of permutations of the following words: [08]
  i) MICROSOFT   **ii)** CONSULTANCY.

  b) Find the value of x if: [08]
   $4\log_2 16 + 3x\log_3 81 - 12 \log_5 625 = 0.$

Q.7 **a)** If $A = \begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 6 \\ 2 & 3 \end{bmatrix}$ then [08]
  find : **i)** AB   **ii)** $(AB)^{-1}$

  b) The probability that A can solve the problem is $\dfrac{3}{5}$ and that can be solved by B [08]
  is $\dfrac{2}{7}$. If they solve the problem independently, what is the probability that:
   i) none solves the problem?
   ii) only B solves the problem?
   iii) the problem is solved?
   iv) both of them solve the problem?

Q.8 Write short notes on **ANY FOUR** of the following: [16]
  a) Counting principles and its applications
  b) Binomial distribution
  c) Types of matrices
  d) Recursively defined functions
  e) Venn Diagram

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