Subject : Mathematical Foundations

Day : Saturday

Date : 17/12/2016

S.D.E. ‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖
33262

Time : 10.00 AM TO 1.00 PM

Max Marks : 80   Total Pages : 2

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)** Explain the following: [08]
- **i)** Singular matrix
- **ii)** Indexed classes of sets
- **iii)** Transpose of a matrix
- **iv)** Prime numbers

b) Six men and five women sit at a round table. Find the number of ways can they sit themselves so that [08]
- **i)** no two women are together.
- **ii)** no two men are together.

Q.2 **a)** The seventh term of an A.P. is 30 and the tenth term is 21, find the fourth term. [08]

b) If $f(x) = x^3 - 6x + 11$ find: [08]
- **i)** $f(-3)$ **ii)** $f(2)$ **iii)** $f(x + 1)$ **iv)** $f(-x)$.

Q.3 **a)** Check the following statements for their equivalence. [08]
- **i)** $p \leftrightarrow q \equiv (p \wedge q) \vee (\sim p \wedge \sim q)$
- **ii)** $\sim [(p \vee \sim q) \rightarrow (p \wedge \sim q)] \equiv (p \vee \sim q) \wedge ((\sim p \vee \sim q)$

b) Find the inverse of $A = \begin{bmatrix} 1 & 2 & 3 \\ -1 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$. [08]

Q.4 **a)** Check whether following points are collinear by using vector method: [08]
- **i)** $P(4, 5, 2)$ **ii)** $Q(3, 2, 4)$ **iii)** $R(5, 8, 0)$.

b) Expand the following by using binomial theorem. Also state the coefficient of $x^{10}y^5$ in the expansion: [08]
$$(2x - 3y)^{15}$$

Q.5 **a)** If $U = \{1, 2, 3, 4, 5, 6, 7\ 8, 9, 10, 11, 12, 13, 14, 15\}$, [08]
$A = \{x \mid x \in N, x \text{ is odd number and } x < 15\}$,
$B = \{y \mid y \in N, y \text{ is a prime number and } y < 15\}$ and
$C = \{1, 4, 9\}$ then
find:
- **i)** $n(A \cup B \cup C)'$ **iii)** $n(A' \cup B' \cup C')$
- **ii)** $n(A \cap B \cap C)$ **iv)** $n[(A \cup B) \cap (B \cup C)]$

b) Explain division algorithm with suitable example. [08]

P.T.O.