

M. Marks: 60

Time: 3Hours

**Note: Section A is compulsory. Attempt any 4 questions from section B.**
**Section – A**
**(2 marks each)**

1. (i) Find  $A - B$ , given that  $A = \{3, 6, 12, 15, 18, 21\}$  and  $B = \{4, 8, 12, 16, 20\}$ .
- (ii) Define bijective function and give one example.
- (iii) Prove that  $A - (B \cup C) = (A - B) \cap (A - C)$ .
- (iv) Using Venn diagram, define disjoint sets.
- (v) How many terms are there in binomial expression of  $[(1 - 2y)^2]^7$ .
- (vi)  $P(n)$ : " $n(n+2)$  is multiple of 5", is a statement. Is this statement true for  $P(4)$ ?
- (vii) Find the values of  $x, y, z$ , if  $\begin{bmatrix} x-3 & 3x-z \\ x+y+2 & x+y+z \end{bmatrix} = \begin{bmatrix} -2 & 0 \\ 5 & 6 \end{bmatrix}$ .
- (viii) Write the matrix with elements  $a_{ij} = 2i + j$ ,  $i, j = 1, 2, 3$ .
- (ix) Give two merits and demerits of median.
- (x) Find the mode of the data 50, 73, 40, 44, 76, 40, 65, 35 and 40,

**Section – B**
**(10 marks each)**

2. Check if relation  $R$  in the set  $N$  of natural numbers, defined as  $R = \{(x, y) : y = x + 5 \text{ and } x < 4\}$ , is reflexive, symmetric and transitive.
  3. (a) Let  $A = \{p, q, r, s\}$ ,  $B = \{p, q, r\}$  and  $C = \{q, s\}$ . Find all sets  $X$  such that  
(i)  $X \subset B$  and  $X \subset C$  (ii)  $X \subset A$  and  $X \not\subset B$ .
  - (b) Show that the function  $f : \mathbb{N} \rightarrow \mathbb{N}$  given by  $f(x) = 2x$ , is one-one.
  4. Give the definition of the following terms:  
(i) Partitioning of set (ii) Equivalent sets (iii) Proper subset (iv) Universal set
  5. (a) Use the method of induction, prove that  $4^n - 3n - 1, n \in N$  is divisible by 9.
  - (b) Find  $a$ , if  $17^{\text{th}}$  and  $18^{\text{th}}$  terms in the expansion of  $(2 + a)^{50}$  are equal.
  6. (a) Show that  $\begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix} = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ .
  - (b) Verify  $(AB)^{-1} = B^{-1} A^{-1}$  for the matrix  $A$  and  $B$ , where  $A = \begin{bmatrix} 2 & 1 \\ 5 & 3 \end{bmatrix}$  and  $B = \begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$ .
  7. (a) Form a frequency table for the variable values: 20, 22, 32, 20, 22, 29, 23, 27, 28, 22, 23, 32, 28, 23, 29, 29, 20, 32, 29, 23, 27, 32, 27, 23, 29, 22, 24, 26, 23, 28.
  - (b) Find the mean of the following distribution
- |           |       |        |         |         |         |         |         |
|-----------|-------|--------|---------|---------|---------|---------|---------|
| Class     | 0 – 7 | 7 – 14 | 14 – 21 | 21 – 28 | 28 – 35 | 35 – 42 | 42 – 49 |
| Frequency | 19    | 25     | 36      | 72      | 51      | 43      | 28      |