Bachelor of Arts (FYUP) 1st Semester
(2124)
MATHEMATICS
Paper : Basic Mathematics-I MATIDC

Time Allowed : Three Hours]   [Maximum Marks : 68

Note :— Do **FOUR** questions in all, including question number **1**, and by selecting **ONE** question from each of the three Units.

1. (a) Let A = {3, 4, 6, 8} and B = {3, 5, 7} be two subsets of a universal set U = {3, 4, 5, 6, 7, 8, 9}, verify $(A \cup B)^c = A^c \cap B^c$.

   (b) Does the relation R : {(1, 2), (2, 3), (4, 5), (2, 1), (3, 5)} form a function ? Write down domain and range of the relation R.

   (c) Solve the inequality $\dfrac{1}{1-x} > 2$ for all real values of x.

   (d) Find the value of x, if $\det.\begin{bmatrix} 2 & 4 \\ 5 & 1 \end{bmatrix} = \det.\begin{bmatrix} 2x & 4 \\ 6 & x \end{bmatrix}$

   (e) Given 4 flags of different colours, how many different signals can be generated, if a signal requires the use of 2 flags one below the other ?

(f) How many eight digit numbers can be formed if all the digits are different ?

(g) Calculate mean deviation about the median from the following data : 340, 150, 210, 240, 300, 310, 320.

$2×7=14$

UNIT—I

2. (a) Let a function f = {(1, 1), (2, 3), (0, −1), (−1, −3)} be described by a formula $f(x) = ax + b$ for some integers a and b. Determine a and b.

(b) By using principal of mathematical induction show that the statement $P(n) : 1 + 2^2 + 3^2 + ... + n^2 = \dfrac{n(n+1)(2n+1)}{6}$ is true for all $n \in N$. $9×2=18$

3. (a) Express the matrix $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

(b) If $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ then show that $A^2 - 4A + 7I = 0$ and by using this equation calculate A^5. $9×2=18$

UNIT—II

4. (a) Without expanding the determinants show that

$$\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} + \begin{vmatrix} 1 & 1 & 1 \\ yz & zx & xy \\ x & y & z \end{vmatrix} = 0$$

(b) Find inverse of the matrix $A = \begin{bmatrix} 1 & 4 & 6 \\ 0 & 2 & 5 \\ 1 & 4 & 3 \end{bmatrix}$ $9×2=18$

5. (a) Calculate mean deviation from mean from the following data :

   x_i: 3   9   17   23   27

   f_i: 8   10   12   9   5

   (b) Calculate variance and standard deviation from the following data :

   x_i: 2   4   6   8   10   12   14   16

   f_i: 4   4   5   15   8   5   4   5

   $9 \times 2 = 18$

UNIT—III

6. (a) Solve the inequality $\dfrac{x-2}{x+5} > 2$.

   (b) Solve the inequality $6 \le -3\,(2x - 4) < 12$ graphically.

   $9 \times 2 = 18$

7. (a) Find middle term(s) in the expansion of $(2x + 3y)^5$.

   (b) Show that $C_r^n + C_{r-1}^n = C_r^{n+1}$, where C_r^n is the number of ways of selecting r objects out of n objects. $9 \times 2 = 18$