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Class – M.Sc. Bioinformation (Sem.II)

Subject – Basic Mathematics

Paper – BI-523

Time Allowed : 2 hrs.

Maximum Marks : 75

Note: Question 1st is compulsory. Total questions 11 & attempt one question from each unit.

Section-A

1. Find x and y if

(i) $(3y-2) + i(7-2x) = 0$

(ii) Express $\begin{bmatrix} 4 & 2 & -1 \\ 3 & 5 & 7 \\ 1 & -2 & 1 \end{bmatrix}$ as a sum of symmetric &

skew symmetric matrix.

(iii) If $f(x) = x^2 - 3x + 1$ for what value of x

$2f(x) = f(2x)$

(iv) Find $\lim_{n \rightarrow \infty} \frac{1+2+3+\dots+n}{n^2}$

(v) Find the derivative of $f(x) = 2x^2 + 3x - 4$ at $x = 5/2$

(vi) Find the point of intersection of the straight line

$x-4y = 3, 6x - y = 11$

(vii) Find the equation of circle of centre is $(2, -1)$ and passes through the pt $(3, 6)$.

(viii) Define Modulus function and find the graph of

$$\frac{|x-2|}{x-2}$$

(ix) Find n^{th} term of the seq. 5, 2, -1, -4, -7,

(x) Evaluate $\int \left(x + \frac{1}{x}\right)^2 dx$ 1.5x10=15

Section-B

Unit-I

12x5=60

2. (a) Find domain and range of the function $f(x) = \frac{|x-1|}{x-1}$,
 $f(x) = \sqrt{x-3}$,
 $f(x) = \frac{1}{(2x-3)(x+1)}$

(b) $A = \{3, 4, 7, 8, 10\}$, $B = \{6, 3, 9, 11\}$ and $C = \{2, 5, 7, 11\}$

Find $(A \cup B) \cap C$ and $(A \cap B) \cup C$.

3. (a) If $x = 2 + \sqrt{-3}$ find the value of

$$4x^2 + 8x + 35$$

(b) Which of following relations are functions. Give reasons if it is a function, determine its domain & range

(i) $\{(2,1), (5,1), (8,1), (11,1), (14,1)\}$

(ii) $\{(1,2), (1,3), (2,5)\}$

Unit-II

4. (a) Show that $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ satisfies $x^2 - 3x - 7 = 0$

find A^{-1} .

- (b) Find the matrix A satisfying the matrix equation

$$\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix} A \begin{bmatrix} 4 & 7 \\ 3 & 5 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

5. (i) Prove that $\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix} = x^2(x+a+b+c)$

- (ii) If $A = \begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$

Find $(A + 2B)'$

Unit-III

6. (i) Determine for which value of x , the function $f(x) = x^3 - 24x + 7$ is strictly increasing or decreasing.
- (ii) $Z = \log(x^2 + y^2)$, $Z = ax^2 + 2hxy + by^2$

find $\frac{\partial z}{\partial x}$, $\frac{\partial z}{\partial y}$,

7. (i) A stone is dropped into a quiet lake and waves move in circles at a speed of 4 cm/sec. At the

instant when the radius of circular wave is 10cm, how fast is the enclosed area increasing.

(ii) Find $\frac{dy}{dx}$ of $y = \sqrt{\frac{ax+b}{cx+d}}$

Unit-IV

8. (i) Determine 2nd term and rth term of an A.P. whose 6th term is 12 & 8th term is 22.

(ii) Determine the number n in a G.P. $\{a_n\}$, if $a_1 = 3$, $a_n = 96$, $S_n = 189$

9. (i) Integrate $\int \frac{x^3 + 5x^2 - 4}{x^2} dx$

(ii) Find the area of the region bounded by $y^2 = 4x$, $x=1$, $x=4$ and x-axis in first quadrant.

Unit-V

10. (i) Find the equation of the st. line bisecting the segment joining the points (5,3), (4,4) and making an angle 45° with the x-axis.

(ii) Find the equation of the circle whose centre lies on the line $x-4y = 1$ and which passes through the points (3,7) and (5,5).

11. (i) Find the equation of bisectors of the angle formed by the lines $3x - 4y + 12 = 0$ and $4x + 3y + 2 = 0$

(ii) Find the equation of sphere passing through the points (a,0,0), (0,b,0), (0,0,c) and (0,0,0)
