Sr. No. 7103

Exam. Code: 206602
Subject Code : 4596

M. Sc. Bio-Informatics - 2nd Sem.

(2517)

Paper -BI-523: Basic Mathematics

Time allowed: 3 hrs. **Max. Marks: 75**

Note: Attempt SIX questions in all. Section-A is Compulsory. Attempt ONE question from each Unit of Section-B.

Section-A

1. a) If A={1, 2, 3}, B={3,4}, C={4, 5, 6}. Find Ax(B∩C)

   b) Define greatest integer function. Represent it graphically in [-2,2]

   c) Find the conjugate and reciprocal of the complex number $3+\sqrt{7}\,i$

   d) Find the value of $\begin{vmatrix} a-b & b-c & c-a \\ x-y & y-z & z-x \\ p-q & q-r & r-p \end{vmatrix}$

   e) If $\vec{a} = \vec{i} - 3\vec{j} + \vec{k}$ and $\vec{b}=\vec{i}+\vec{j}+\vec{k}$, find $|\vec{a} \times \vec{b}|$

   f) If $z=x^3+y^3-3axy$, find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$

   g) Find the interval in which the function $f(x)=x^2-zx$ is increasing.

   h) Find $\lim_{x \to 5} \frac{x^2-10x+25}{x^2-7x+10}$

   i) Evaluate $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$

   j) Find the equation of the line passing through (g, o) and parallel to 3x-2y+5=0. $(10 \times 1\frac{1}{2} = 15)$

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Section-B

Unit-I

2. a) If A={a,b,c,d}, B={c,d,e}, C={a,e}, determine $(A \cap B) \cup C$ and $A \cup (B \cap C)$. (6)

b) Let A = {1,2,3,4,5}, N={x : x is a natural number}. Is the following relation a function from A to N. If so, is it 1-1? Is it onto? (6)

3. a) Write $\frac{(2-3i)(5+3i)}{(3+2i)(-4-i)}$ in the form x+iy, where x and y are real numbers. (4)

b) If z is a complex number such that |z+1|=z+2(1+i), find z (8)

Unit-II

4. a) Find the inverse of the matrix $\begin{bmatrix} 2 & -3 \\ 4 & 5 \end{bmatrix}$. (6)

b) Show that $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix}$ = (a-b) (b-c)(c-a) (6)

5. a) If $\vec{a}$ and $\vec{b}$ are two vectors such that $|\vec{a}|=2$, $|\vec{b}|=7$ and $\vec{a} \times \vec{b} = 3\vec{c} + 2\vec{j} + 6\vec{k}$, find the angle between $\vec{a}$ and $\vec{b}$ (6)

b) Prove that $[\vec{a}+\vec{b} \quad \vec{b}+\vec{c} \quad \vec{c}+\vec{a}] = 2[\vec{a}\ \vec{b}\ \vec{c}]$ (6)

Unit-III

6. a) If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$, show that $2x\frac{dy}{dx} + y - 2\sqrt{x} = 0$ (6)

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b) Find the minimum value of $y=x^3-3x$ in $0<x<2$ (6)

7. a) If $u=e^{xyz}$, find $\frac{\partial u}{\partial x}$, $\frac{\partial u}{\partial y}$ and $\frac{\partial u}{\partial z}$ (6)

b) If $s=t^3-2t^2+3t-4$, give the position and velocity of the particle at the end of 2 seconds and initially. (6)

Unit-IV

8. a) Which term of the series $1-\frac{1}{2}+\frac{1}{4}-\frac{1}{8}+\ldots$ is $-\frac{1}{128}$? (6)

b) Evaluate :

(i) $\int \frac{1+3x+7x^2-2x^3}{x^2}dx$

(ii) $\int (e^{3x}+4x^2+7)dx$ (3+3)

9. a) Evaluate :

(i) $\int_2^3 (1+4x+x^2)dx$

ii) $\int_0^{\frac{\pi}{2}} (cosx-sinx)dx$ (3+3)

b) Find the area bounded by $y=x^3$, $y=0$, $x=1$ and $x=3$. (6)

Unit-V

10. a) Find the equation of the straight line which makes equal intercepts on the axes and pass through the point (2,3). (6)

b) Find the equation of circle whose centre is the point (1, -2) and which passes through the centre of the circle $x^2+y^2+2y=3$. (6)

11. a) Find the equation of the parabola whose focus is the point (1,-1) and directrix is the line $x+y+z=0$. (6)

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b) Find the equation of sphere concentric with

$x^2+y^2+z^2-2x-4y-2z-13=0$

but of double the radius. (6)

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