Exam.Code:0439
Sub. Code: 3490

2122

M.Sc. (Bio-Informatics) First Semester
MBIN-8002: Mathematics

Time allowed: 3 Hours | Max. Marks: 60

***NOTE**: Attempt <u>five</u> questions in all, including Question No. I which is compulsory and selecting atleast one question from each Unit.*

x-x-x

Que. 1

(*a*) Solve for x, if $(256 \div 2^{3x})^2 = (4)^x$.

(*b*) Evaluate $\lim_{x \to 0} x \sin(\frac{1}{x})$

(*c*) Evaluate $\lim_{x \to 0} \frac{x}{\sqrt{a+x} - \sqrt{a-x}}$

(*d*) Convert 12378 into an equivalent number in the Hexadecimal system.

(*e*) Draw graph of the function $f(x) = (x + 1)^2 - 1$.

(*f*) Insert 4 numbers between 4 and $\frac{243}{8}$ such that the resulting sequence is a G.P. (6×2)

Unit-I

Que. 2

(*a*) If $(1/5)^{3x} = 0.008$. Find the value of $(0.25)^x$. (4)

(*b*) Define a rational number and show that $5 - \sqrt{3}$ is not a rational number. (4)

(*c*) For any two complex numbers z_1 and z_2 show that $|z_1 + z_2| \leq |z_1| + |z_2|$. (4)

Que. 3

(*a*) Draw graph of the function $f(x) = 1 - \log x$. Also find range and domain of this function and from its graph show that it is a 1-1 function. (4)

(*b*) How many terms of A.P. $-6, -\frac{11}{2}, -5 \ldots$ are needed to give the sum -25? (4)

(*c*) Find middle term in the expansion of $(x + \frac{1}{2x})^{2n}$. (4)

Unit-II

Que. 4

(*a*) Evaluate $\lim_{x \to 0} f(x)$; where $f(x) = \begin{cases} 2x + 3; & x > 0 \\ 3(x + 1); & x \leq 0 \end{cases}$ (4)

(*b*) Find derivative of the function $f(x) = \tan x \cdot e^{\sin x}$. (4)

(*c*) Find local maximum and local minimum values of the function f given by

$f(x) = 3x^4 + 4x^3 - 12x^2 + 12$ (4)

Que. 5

(*a*) Evaluate $\int_0^2 x\sqrt{2-x}\,dx$ (4)

(*b*) Verify that the equation $x^2 + y^2 + 2x - 4y + C = 0$ is a solution of the differential equation $\frac{dy}{dx} = \frac{x+1}{2-y}$. (4)

(*c*) Evaluate the integral $\int \frac{1-\sin x}{\cos^2 x}\,dx$ (4)

Unit-III

Que. 6.

(*a*) Express the following matrix as a sum of a symmetric and a skew symmetric matrix.

$$A = \begin{bmatrix} 1 & 4 & 6 \\ 7 & 2 & 5 \\ 1 & -4 & 3 \end{bmatrix}$$ (4)

(*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. (4)

(c) Without expanding the determinant, show that $\begin{vmatrix} cosec^2x & cot^2x & 1 \\ cot^2x & cosec^2x & -1 \\ 42 & 40 & 2 \end{vmatrix} = 0$. (4)

Que. 7.

(*a*) Check the validity of the following argument:

If the band could not play rock music or the refreshments were not delivered on time, then the New Year's party would have been cancelled and Alicia would have been angry. If the party were cancelled, the refunds would had to be made. No refunds were made. Therefore the band could play the rock music. (4)

(*b*) Show that $(p \wedge q) \rightarrow (p \vee q)$ is a tautology. (4)

(*c*) Show that the Boolean identity $x + yz = (x + y)(x + z)$ is valid. (4)