Exam.Code:0439
Sub. Code: 3490

2022

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 Section.*

x-x-x

I (a) How many terms are there in geometric progression

2, 4, 8, …, 128.

(b) Simplify the surd $\frac{\sqrt{2000}}{\sqrt{50}}$.

(c) Find $\vec{B} \times \vec{A}$ if $\vec{A}$=2i+j+k, $\vec{B} = -4i + 3j + k$.

(d) Find the sum of the first 50 terms of the sequence 1. 3, 5, 7, 9, …

(e) Find the expansion of $(2x - y)^4$.

(f) For f(x) =x+1 and g(x)=$\sqrt{5x}$, find g∘f(1).

(g) Determine the coefficient of x^3 in the expansion of $\frac{1}{(1+x)^2}$.

(h) For $z_1 = 6 - 2i, z_2 = 3 + 4i$. Find $z_1 z_2$. (8 × 1.5)

Section A

II (a) An arithmetic progression has 3 as its first term. Also the sum of the first 8 term. Also, the sum of the first 8 terms is twice the sum of the first 5 terms. Find the common difference. (6)

(b) From the 26 letters in English, 11 have vertical symmetry, 9 have horizontal symmetry and 4 have both types of symmetries. How many have neither ? (6)

III(a) Solve each of the following equations for the complex number z

(i) $4 + 5i = z - (1 - i)$

(ii) $(1 + 2i)z = 2 + 5i$ (3+3)

(b) Find the term independent of x in the expansion of $(\frac{\sqrt{x}}{\sqrt{3}} + \frac{\sqrt{3}}{2x^2})^{10}$. (6)

Section B

IV(a) Evaluate $\int \frac{-2x+4}{(x^2+1)(x-1)^2} dx$. (6)

(b) Evaluate $\lim_{x\to\infty} \frac{x^3+1}{3x^3-4x+5}$. (6)

P.T.O.

V(a) (i) If y=(x+2)($(x^2 + 1)$. Find $\frac{dy}{dx}$.

(ii) If y =log(x+$\sqrt{(x^2 + a^2)}$. Prove that $\frac{dy}{dx} = \frac{1}{\sqrt{x^2+a^2}}$. (3+3)

(b) If y=$acosmx + bsinmx$. Prove that $\frac{d^2y}{dx^2} + m^2y=0$. (6)

Section C

VI(a) If A = $\begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 3 \\ -3 & -2 & 4 \end{bmatrix}$. Find A^{-1}. (6)

(b) Determine the value of λ for which the system of equations

$$x + y + z = 1$$
$$x + 2y + 4z = \lambda$$
$$x + 4y + 10z = \lambda^2$$

possesses a solution and hence find a solution. (6)

VII(a) Find a unit vector which is coplanar with $\vec{a}$ *and* $\vec{b}$ but is perpendicular to $\vec{c}$

$\vec{a}$= 2i-j+k

$\vec{b}$=-i+j+k

$\vec{c}$= i+2k

(6)

(b) Construct a truth table to show that $(\overline{X + YZ})$ ==$\bar{X}.(\bar{Y} + \bar{Z})$. (6)

x-x-x