

2124

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

Time allowed: 3 Hours

Max. Marks: 60

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting atleast one question from each Unit.

X-X-X

1. (a) Let $A = \{3, 4, 6, 8\}$ and $B = \{3, 5, 7\}$ be two subsets of a universal set

$$U = \{3, 4, 5, 6, 7, 8, 9\}, \text{ verify } (A \cup B)^c = A^c \cap B^c.$$

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

- (d) Find 2nd derivative of $y = \log(ax^2 + b)$. (3) × 4

Unit-I

2. (a) Find the values of a and b in the equations $a - 3\sqrt{3} = \frac{b + \sqrt{3}}{2 + \sqrt{3}}$.

(b) Solve the equation $3\sqrt{2x+3} + 2\sqrt{3-x} = 7$ (6) × 2

3. (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 and also plot graph of this function.

(b) Find middle term(s) in the expansion of $(2x + 3y)^5$. (6) × 2

Unit-II

4. (a) Evaluate $\lim_{x \rightarrow \infty} \frac{\sin x}{x}$

(b) Evaluate $\lim_{x \rightarrow 2} \frac{x^3 - 4x^2 + 4x}{x^2 - 4}$ (6) × 2

5. (a) Integrate $\int \frac{3x}{1 + 9x^2} dx$

(b) Determine the general solution of the differential equation $\frac{dy}{dx} + 3x^2y = 6x^2$. (6) × 2

P.T.O.

(2)

Unit-III

6. (a) Find adjoint of the matrix $A = \begin{bmatrix} 1 & 4 & 0 \\ 3 & 2 & 1 \\ -2 & -4 & 3 \end{bmatrix}$. Let I be the identity matrix of order 3,

verify that $A (\text{adj. } A) = A (\text{adj. } A) = |A| I$.

(b) Without expanding the determinants show that $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} + \begin{vmatrix} 1 & 1 & 1 \\ yz & zx & xy \\ x & y & z \end{vmatrix} = 0 \quad (6) \times 2$

7. (a) Verify that the following compound proposition is a tautology

$$(p \rightarrow q) \wedge (q \rightarrow r) \rightarrow (p \rightarrow r)$$

(b) Using Boolean identities, reduce the following Boolean expression

$$F(X, Y, Z) = X'Y + YZ' + YZ + XY'Z'$$

into $Y + XZ'$.

(6) \times 2

x-x-x