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Mid-Term Examination, Odd Semester, 2021-22

B.Tech. (Bio-Tech.), Year I, Semester I

Elementary Mathematics I (BMAS0130)

Time: 02 Hours. **Max. Marks: 30**

Section – A

Note: Attempt All Questions. **3 x 2 = 6 marks**

1. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 5 & 2 \\ 0 & 2 & 10 \end{bmatrix}$, then find the determinant of A.
2. Find the modulus and principle argument of the complex number $\sqrt{3} + i$.
3. Find the roots of the equation $x^2 - 4x + 4 = 0$.

Section – B

Note:Attempt All Questions. **3 x 3 = 9 marks**

1. If $A = \begin{bmatrix} 2 & 3 \\ 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ are two matrices then show that

(i) $A^2 = \begin{bmatrix} 4 & 12 \\ 0 & 4 \end{bmatrix}$

(ii) $AB = BA$

2. Find the inverse of the matrix $\begin{bmatrix} -5 & 4 \\ 0 & 4 \end{bmatrix}$.

3. Express the complex number $\frac{2-3i}{4-i}$ in the form $a + ib$, where a and b are real.

Section – C

Note: Attempt Any Three Questions. **3 x 5 = 15 marks**

1. If $P = \begin{bmatrix} 3 & 4 & 3 \\ 4 & 1 & 6 \\ 4 & 6 & 8 \end{bmatrix}$ and $Q = \begin{bmatrix} 3 & 4 & 3 \\ 6 & 1 & 4 \\ 8 & 6 & 4 \end{bmatrix}$. Then find the following

(i) P+Q (ii) P-Q (iii) PQ (iv) Transpose of P

2. Solve the equations by Cramer's rule

$$x - y + 2z = 3, x + 2y + 3z = 5, 3x - 4y - 5z = -13.$$

3. (A) If the sum and product of the roots of quadratic equation are -3 and 6 respectively. Find the quadratic equation.

(B) Define the Transpose and Adjoint of a matrix. Also find the adjoint of $\begin{bmatrix} 3 & 2 \\ -2 & 5 \end{bmatrix}$.

4. If $z_1 = 1 + 3i$ and $z_2 = 2 - 5i$. Find

(i) $z_1 + z_2$, (ii) $z_1 z_2$, (iii) z_1^2, (iv) $\frac{1}{z_1}$.