

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION)**

**CLASS: BTECH  
BRANCH: BIOTECHNOLOGY**

**SEMESTER : 1<sup>ST</sup>  
SESSION : MO/2024**

**SUBJECT: BE24001 FOUNDATION OF ENGINEERING MATHEMATICS**

**TIME: 02 Hours**

**FULL MARKS: 25**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

- |  | [ ] | CO  | BL |
|--|-----|-----|----|
| Q.1(a) For the following Geometric Progression 1, 1/3, 1/9, 1/27...<br>Find 12 <sup>th</sup> term and sum of all 15 <sup>th</sup> terms  | [2] | 1,2 | 3  |
| Q.1(b) Find the roots of the complex number $-6 + 2/3i$  | [3] | 2,4 | 3  |
| Q.2(a) Find out the product and sum of the following matrices:<br>$A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 1 \\ 4 & 2 & 3 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 2 & 1 \\ 4 & 1 & 5 \end{bmatrix}$                 | [2] | 3   | 4  |
| Q.2(b) Find the eigen values of the matrix<br>$\begin{pmatrix} 3 & -5 \\ -6 & 4 \end{pmatrix}$   | [3] | 3   | 4  |
| Q.3(a) Write the following series,<br>$e^{ax}; a^x \text{ and } \frac{e^x + e^{-x}}{2}$  | [2] | 2,3 | 4  |
| Q.3(b) Find the angle between the following two lines.<br>$6x - 3y = 8$ and $3x + 8y = 4$ and find the distance of the point $(-6, 4)$ from the line $3x + 8y = 4$   | [3] | 2,4 | 3  |
| Q.4(a) Find the equation of a straight line that passes through the point $(-4, 3)$ and perpendicular to the straight line $4x + y - 8 = 0$ .  | [2] | 3   | 4  |
| Q.4(b) Draw and Compare equation of the following conic section, circle, ellipse, parabola and hyperbola.  | [3] | 4   | 3  |
| Q.5(a) Solve the given system of equations using the inverse of a matrix.<br>$x - 8y = 8$<br>$4x + 14y = -3$   | [2] | 3,4 | 3  |
| Q.5(b) $\vec{a} = 3\vec{i} + 2\vec{k}$ , $\vec{b} = 4\vec{i} + 4\vec{j} - 2\vec{k}$<br>$\vec{c} = \vec{i} - 2\vec{j} + 3\vec{k}$ , $\vec{d} = 2\vec{i} - \vec{j} + 5\vec{k}$<br>Compute $(\vec{d} \times \vec{c}) \cdot (\vec{a} - \vec{b})$ | [3] | 2,4 | 5  |