

**ESKPXI-XXVI (I)**  
**MATHEMATICS PART-I**

**Time: 2 Hours 40 Minutes**

**SECTION "B"**

**Marks: 50**

**Q.2. Attempt any TEN (10) questions. All questions carry equal marks.**

- i. Find the additive and multiplicative inverse of complex number,  $-2 + 5i$ . 2+2+1
- ii. Using co – factors, find determinant of the Matrix:  $A = \begin{bmatrix} 5 & -2 & 1 \\ 4 & 5 & 2 \\ 1 & -3 & 4 \end{bmatrix}$  2+2+1
- iii. Reduce the given matrix to its Row Echelon Form:  $\begin{bmatrix} 6 & 3 & 1 \\ 7 & 5 & 2 \\ 5 & 2 & 6 \end{bmatrix}$  1+2+2
- iv. Find the direction cosines of the vector from point A (6, 3, –3) to B(3, 5, 4). 1+1+2+1
- v. Find the angle between two vectors  $\vec{OA}$  &  $\vec{OB}$  where  $\vec{OA} = 4i - 7j$   $\vec{OB} = -3i + 5j$  1+2+2
- vi. Find the sum of the infinite series  $\frac{3}{6} + \frac{3}{36} + \frac{3}{216} + \frac{3}{1296} + \dots$  1+2+2
- vii. Find the sum of the series  $2 * 5 + 4 * 25 + 6 * 125 + 8 * 625 + \dots$  to n term. 1+3+1
- viii. If a pair of dice is rolled, find the probability that the sum of the digits is either 4 or 7. 1+1+2+1
- ix. Find  $\sqrt[3]{\frac{6}{5}}$  correct up to four decimal places. 1+3+1
- x. Without graphing, determine the vertex, axis and opening direction for  $f(x) = x^2 + 6x + 5$ . 1+2+1+1
- xi. Prove that  $\sin 2\theta + 2\sin 3\theta + \sin 4\theta = 2\sin(3\theta)[1 + \cos \theta]$  1+1+2+1
- xii. Find measure of the angles of a triangle whose sides are 5, 8 & 11. 1+3+1
- xiii. Find Domain and Range of  $y = \frac{1}{5}\sin 4x$  1+2+2

**SECTION "C"**

**Marks: 30**

**Note: Attempt any THREE (03) questions from the following. Each question carries equal marks.**

- Q.3.** a) Factorize the polynomial  $P(z) = 4z^3 - 7z^2 + 6z - 3$  into linear factors. 1+1+2+1
- b) Using elementary row operations, find inverse of the Matrix:  $A = \begin{bmatrix} 2 & 5 & 1 \\ 5 & 2 & -2 \\ 7 & 3 & 2 \end{bmatrix}$  1+3+1
- Q.4.** a) For what value of m the following vectors are coplanar? 1+1+2+1  
 $\vec{a} = 3i - 2j + k$ ,  $\vec{b} = 2i + mj - k$ ,  $\vec{c} = 2i - j + k$
- b) Find the 11th term of the harmonic sequence:  $5, \frac{5}{6}, \frac{5}{11}, \dots$  1+1+1+1+1
- Q.5.** a) A student must answer 8 questions out of 12 in an exam. How many ways can the student choose the questions if:  
i). Question number 1 is compulsory (always included).  
ii). The last 2 questions are removed from the syllabus (always excluded). 1+2+2
- b) A transport company has a truck with a weight capacity of 2,000 kg and a volume capacity of 500 cubic feet. They are carrying Crates and Barrels. A crate weighs 40 kg and is 15 cubic feet. A barrel weighs 80 kg and is 10 cubic feet. If the shipping charge is Rs. 200 per crate and Rs.300 per barrel, how many of each should be loaded? 1+2+2
- Q.6.** a) Find the circumscribing radius for a triangle whose sides are 4, 7 & 10. 1+1+2+1
- b) Describe the Amplitude, Period & Frequency without drawing the graph of the function:  $y = 5\cos \frac{x}{4}$  1+2+2