

**STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 600 086**  
**(For candidates admitted from the academic year 2023 – 2024)**

**B. A DEGREE EXAMINATION, APRIL 2024**  
**BRANCH IV - ECONOMICS**  
**SECOND SEMESTER**

**COURSE : ALLIED CORE**  
**PAPER : MATHEMATICAL METHODS FOR ECONOMICS**  
**COURSE CODE : 23EC/AC/MM25**  
**TIME : 3 HOURS** **MAX. MARKS: 100**

| Q. No. | SECTION- A<br>PART - A  | CO | KL |
|--------|---|----|----|
|        | <b>Answer all TEN questions Each answer not to exceed 50 words. (10 x 2 = 20)</b>   |    |    |
| 1      | Find the slope of the points (1, -2) and (3, -6).   | 1  | 1  |
| 2      | Find the equation of the line passing through the points (1, -1) and (2, -4).   | 1  | 1  |
| 3      | What is a Scalar Matrix?  | 1  | 1  |
| 4      | Define Input-Output Analysis?   | 1  | 1  |
| 5      | Find $\frac{dy}{dx}$ of $y = e^{4x^2}$ .  | 1  | 1  |
| 6      | Calculate the limit for $\lim_{x \rightarrow -4} 3x^2 + 7x - 12$  | 1  | 1  |
| 7      | If $AC = 2x + 1 - \frac{5}{x}$ , Find TC and MC.  | 1  | 1  |
| 8      | Comment if the Matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ is singular or nonsingular?                      | 1  | 1  |
| 9      | If $Q = 0.6K^2 - 3KL + L^2$ , Find $MP_L$ and $MP_K$  | 1  | 1  |
| 10     | Illustrate the shape of the Average Cost.   | 1  | 1  |
| Q. No. | Part - B  | CO | KL |
|        | <b>Answer any TEN questions. Each answer not to exceed 50 words. (10 x 2 = 20)</b>  |    |    |
| 11     | Find the equilibrium price and quantity from the data given<br>$Q_s = -20 + 3P$ and $Q_d = 220 - 5P$                      | 2  | 2  |
| 12     | Solve for x from the following linear equation<br>$36 - 4x = 7x - 34$   | 2  | 2  |
| 13     | If $A = \begin{bmatrix} 6 & 7 \\ 2 & 3 \end{bmatrix}$ $B = \begin{bmatrix} -6 & 2 \\ 4 & -8 \end{bmatrix}$ , Find $A+B$ . | 2  | 2  |
| 14     | State the meaning of a Quadratic Function with an example.  | 2  | 2  |

|               |   |           |           |
|---------------|---|-----------|-----------|
| 15            | If $y = \log 2x$ , Find $dy/dx$ .   | 2         | 2         |
| 16            | Define Price Elasticity of Demand.  | 2         | 2         |
| 17            | Find the MR function from the following Demand function<br>$Q = 36 - 2P$ .  | 2         | 2         |
| 18            | Differentiate $y = (7x + 9)^2$  | 2         | 2         |
| 19            | State Hawkins Simon Conditions.   | 2         | 2         |
| 20            | Find the determinant of $A = \begin{bmatrix} 18 & -1 \\ -2 & 36 \end{bmatrix}$  | 2         | 2         |
| 21            | Find the distance of a point P (4,3) from the origin.   | 2         | 2         |
| 22            | State any two properties of Parallel Lines.   | 2         | 2         |
| <b>Q. No.</b> | <b>SECTION - B</b><br><b>PART - A</b><br><b>Answer any FOUR questions. Each answer not to exceed 250 words.</b><br><b>(4 x 5 = 20)</b>  | <b>CO</b> | <b>KL</b> |
| 23            | Optimize $f(x) = 2x^3 - 30x^2 + 126x + 59$ and state whether the function is at a relative maximum or relative minimum.   | 3         | 3         |
| 24            | Illustrate the Input-Output Transaction Matrix.   | 3         | 3         |
| 25            | Prove Young's Theorem for $z = x^{0.3}y^{0.5}$  | 3         | 3         |
| 26            | Find the Inverse of the Matrix $A = \begin{bmatrix} 4 & 2 & 5 \\ 3 & 1 & 8 \\ 9 & 6 & 7 \end{bmatrix}$  | 3         | 3         |
| 27            | Suppose the demand function for a certain good is given by $Q = 100 - 2P + 0.5I - 0.3PC$ , where Q is the quantity demanded, P is the price of the good, I is income, and PC is the price of a related good.<br>Find the income elasticity of demand ( $E_I$ ) for this good and calculate the cross elasticity of demand ( $E_{PC}$ ) with respect to the price of the related good. | 3         | 3         |
| 28            | Differentiate $y = \frac{18x^2}{x^2-1}$   | 3         | 3         |

| Q. No. | <b>PART - B</b><br><b>Answer any FOUR questions. Each answer not to exceed 250 words.</b><br><b>(4 x 5 = 20)</b>  | CO | KL |
|--------|---|----|----|
| 29     | Find the Minors and Cofactors of for the elements of the first row<br>$A = \begin{bmatrix} 5 & 2 & -4 \\ 6 & -3 & 7 \\ 1 & 2 & 4 \end{bmatrix}$   | 4  | 4  |
| 30     | Solve by Cramer's Rule<br>$2x + 4y - z = 52$<br>$-x + 5y + 3z = 72$<br>$3x - 7y + 2z = 10$  | 4  | 4  |
| 31     | Find $\frac{dy}{dx}$ for the function $7x^4 + 3x^3y + 9xy^2 = 280$  | 4  | 4  |
| 32     | Given $Y = C + I$ , when $C = 89 + 0.8Y$ and $I_0 = 24$ , Find the Equilibrium Level of Income.   | 4  | 4  |
| 33     | For $z = f(x, y) = 6x^3 + 7y$ where $y = g(x) = 4x^2 + 3x + 8$ , Find the total derivative $\frac{dz}{dx}$ .  | 4  | 4  |
| 34     | Derive the relationship when $AC > MC$ .  | 4  | 4  |
| Q. No. | <b>SECTION – C</b><br><b>Answer any TWO questions. Each answer not to exceed 600 words.</b><br><b>(2x 10 =20)</b>   | CO | KL |
| 35     | Given the following functions, $C = 100 + 0.8Y$ , $I = 120 - 5i$ ,<br>$M_s = 120$ ,<br>$M_d = 0.2Y - 5i$ , Find the equilibrium income and interest rate.   | 5  | 5  |
| 36     | List any 5 properties of determinants with examples.  | 5  | 5  |
| 37     | Calculate the maximum profit from the information provided<br>$TR = 5900Q - 10Q^2$ and $TC = 2Q^3 - 4Q^2 + 140Q + 845$  | 5  | 5  |
| 38     | Consider an economy with three sectors: Agriculture (A), Manufacturing (M), and Services (S). The input-output matrix representing the relationships between these sectors is given by:<br>$\begin{bmatrix} A \\ S \\ M \end{bmatrix} = \begin{bmatrix} 0.3 & 0.2 & 0.1 \\ 0.4 & 0.5 & 0.3 \\ 0.3 & 0.3 & 0.6 \end{bmatrix}$<br>Determine the total output generated by each sector when Rs. 500 worth of final output is produced. | 5  | 5  |

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