

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

**M.A DEGREE EXAMINATION, NOVEMBER 2023**  
**BRANCH III - ECONOMICS**  
**FIRST SEMESTER**

**COURSE : ELECTIVE**  
**PAPER : MATHEMATICS FOR ECONOMICS**  
**SUBJECT CODE: 23EC/PE/ME15**  
**TIME : 3 HOURS** **MAX. MARKS: 100**

| Q. No. | SECTION A<br>PART – A<br>(2 X 5 = 10)<br>Answer any TWO out of THREE questions in about 150 words each        | CO | KL |
|--------|---|----|----|
| 1      | Find the inverse of A<br>$\begin{bmatrix} 7 & 9 \\ 6 & 12 \end{bmatrix}$                                      | 1  | 1  |
| 2      | Find the First and second order Direct Partial Derivatives<br>$Z = 13x^2 + 6xy + 9y^3$                        | 1  | 1  |
| 3      | If Average Cost = $12t^2 - 18t + 28$<br>Find TC and MC.   | 1  | 1  |
| Q. No. | PART – B<br>(2 X 5 = 10)<br>Answer any TWO out of THREE questions in about 150 words each                     | CO | KL |
| 4      | Explain the concepts of Slack and Surplus Variables.  | 2  | 2  |
| 5      | Evaluate<br>$\int_2^4 (5x^3 + 2x^2 + 3x)dx$   | 2  | 2  |
| 6      | Find $dy/dx$ of $4x^3 - y^3 = 97$   | 2  | 2  |
| Q. No. | SECTION B<br>PART – A<br>(2 X 8 = 16)<br>Answer any TWO out of THREE questions in about 400 words each        | CO | KL |
| 7      | Solve by Cramer's Rule :<br>$5x_1 - 2x_2 + 3x_3 = 16$<br>$2x_1 + 3x_2 - 5x_3 = 2$<br>$4x_1 - 5x_2 + 6x_3 = 7$ | 3  | 3  |

|               |   |           |           |
|---------------|---|-----------|-----------|
| 8             | Determine the sign definiteness for matrix A<br>$\begin{bmatrix} 10 & 3 \\ 3 & 4 \end{bmatrix}$   | 3         | 3         |
| 9             | Derive Samuelson's Multiplier Accelerator model.  | 3         | 3         |
| <b>Q. No.</b> | <b>PART – B</b> (2 X 8 = 16)<br><b>Answer any TWO out of THREE questions in about 400 words each</b>  | <b>CO</b> | <b>KL</b> |
| 10            | Solve by the Graphical method<br>Minimize $C = 20x + 40y$<br>Subject to the Constraints $36x + 6y \geq 108$<br>$3x + 12y \geq 36$<br>$20x + 10y \geq 100$<br>Where $x, y \geq 0$  | 4         | 4         |
| 11            | Find the Second order direct Partial Derivatives<br>$Z = (7x + 3y)^3$   | 4         | 4         |
| 12            | The technology matrix of an economic system with two industries is<br>$\begin{bmatrix} 0.50 & 0.30 \\ 0.41 & 0.33 \end{bmatrix}$ Test whether the system is viable as per the Hawkins-Simon Condition.  | 4         | 4         |
|               | <b>SECTION C</b><br><b>PART – A</b> (2 X 12 = 24)<br><b>Answer any TWO out of FOUR questions in about 700 words each</b>  |           |           |
| 13            | Find the profit maximizing level of output, price and profit<br>$Q_1 = 5200 - 10P_1$<br>$Q_2 = 8200 - 20P_2$<br>$C = 0.1Q_1^2 + 0.1Q_1Q_2 + 0.2Q_2^2 + 325$   | 5         | 5         |
| 14            | Determine the total demand for industries 1,2 and 3, given the matrix of technical coefficients A and the final demand vector B.<br>$A = \begin{bmatrix} 0.4 & 0.3 & 0.1 \\ 0.2 & 0.2 & 0.3 \\ 0.2 & 0.4 & 0.2 \end{bmatrix} \quad B = \begin{bmatrix} 140 \\ 220 \\ 180 \end{bmatrix}$ | 5         | 5         |
| 15            | Enumerate the various applications of Linear Programming  | 5         | 5         |

|    |   |   |   |
|----|---|---|---|
| 16 | Calculate the General Solution of the differential equation<br>$dy/dt + 3t^2 y = t^2$   | 5 | 5 |
|    | <b>PART – B</b> (2 X 12 = 24)<br><b>Answer any TWO out of FOUR questions in about 700 words each</b>  |   |   |
| 17 | Given the demand function $P_d = 113Q^2$ and the Supply function $P_s = (Q + 1)^2$ under Pure Competition, Find Consumers' and Producers' Surplus.  | 6 | 6 |
| 18 | A monopolistic firm has the following demand functions for each of its products x and y<br>$x = 72 - 0.5 P_x$<br>$y = 120 - P_y$<br>The combined cost function is $c = x^2 + xy + y^2 + 35$ and the maximum joint production is 40. Find the profit maximizing level of output, price and profit. | 6 | 6 |
| 19 | Construct an Input -Output Transaction Table and list the limitations of Input -Output analysis.  | 6 | 6 |
| 20 | Examine the features of Solow Growth Model.   | 6 | 6 |

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