**STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 86**
**(For Candidates admitted during the academic year 2015 – 2016 and thereafter)**

**SUBJECT CODE: 15EC/PE/ME14**

**M.A. DEGREE EXAMINATION NOVEMBER 2018**
**BRANCH  III – ECONOMICS**
**FIRST SEMESTER**

COURSE    : ELECTIVE
PAPER      : MATHEMATICS FOR ECONOMICS
TIME        : 3 HOURS                                                          MAX. MARKS: 100

**SECTION – A**
**ANSWER ANY FIVE QUESTIONS:**                                          **(5x8=40)**

1.  Solve using Cramer's Rule:
$$-x - 3y - 2z = 5$$
$$4x - y - 3z = -8$$
$$2x = 2y - 5z = 7$$

2.  Use graphical method to solve the following problem:
$$\text{Maximize} x_1 + 1.5x_2$$
$$\text{subject to } 2x_1 + 2x_2 \le 16$$
$$x_1 + 2x_2 \le 12$$
$$4x_1 + 2x_2 \le 28$$
$$x_1, x_2 \ge 0$$

3.  Given the following demand and supply functions, find the equilibrium price and comment on the stability:
$$D_t = 18 - 3p_t$$
$$S_t = -3 + 4p_{t-1}$$

4.  Suppose that the demand equation for a monopolist is $p = 100 - .01x$ and the cost function is $C(x) = 50x + 10,000$. Find the value of $x$ that maximizes the profit and determine the corresponding price and total profit for this level of production. Also comment on the shape of the average cost curve.

5.  Prove that the utility function $U = x^{2/3}y^{1/3}$ satisfies Euler's Theorem. Show that it also satisfies Young's Theorem.

6.  Find the rank of the matrix
$$A = \begin{matrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 4 & 3 \end{matrix}$$
Comment on its inverse.

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7.  State and prove the relationship between average revenue, marginal revenue and price elasticity of demand.

    Comment on the convexity of the curve $y = x^3 - 3x^2 + 9x$ at $x = 1$

## SECTION – B

**ANSWER ANY THREE QUESTIONS:**                                        **(3 x 20=60)**

8.  An economy produces only coal and steel. The two commodities serve as intermediate inputs in each other's production. 0.4 tonne of steel and 0.7 tonne of coal are needed to produce a tone of steel. 0.1 tonne of steel and 0.6 tonne of coal are required to produce a tone of coal. 2 and 5 labour days are required to produce a tone of coal and steel respectively. The economy needs 100 tonnes of coal and 50 tonnes of steel. Calculate the gross output of coal and steel. Also find the total labour required. Determine the equilibrium prices if wage rate is Rs. 10 per labour day.

9.  For a production function $Q = \frac{2KL - K^2 - L^2}{K+L}$, show that the average and marginal products of the factors depend only on the ratio of the factors. Comment on the homogeneity of the function.

10. Maximise$U = x^{1.5}y$, when the money income is 100, and price of $x$ is 3 and that of $y$ is 4. How does the result change if $U = x^{0.5}y^{0.5}$

11. Given the demand and supply functions $p_d = (6 - x)^2$ and $p_s = (x + 14)$ find the consumers' surplus in a competitive market. What happens to the result if it is a monopoly market, with $C = x^2 + 14x + 56$?

12. State the mathematical assumptions made in the context of Solow's growth model. Explain the working of model using linear differential equation. Comment on the nature of stability.

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