

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 2017
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 the following non homogeneous equations of three unknowns using Cramer's rule.
 $x + 2y + z = 7,$ $2x - y + 2z = 4,$ $x + y - 2z = -1.$
2. Find out the elasticity of demand and marginal revenue, when the price is Rs. 2, if the demand function $Q = 30 - 5q - p^2$.
3. (a) Given the function $z = 2x^3 + 5x^2y + xy^2 + y^2$, find the first and second order partial derivatives and also verify that $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$.
(b) Find the total derivative of $z = \frac{x^2 - y^2}{x^2 + y^2}$.
4. The price of commodity x is Rs. 2 per unit while the price of commodity y is Rs. 1 per unit. The individual's money income is Rs. 16 per time period and is all spent on x and y, with utility function $= f(x, y)$. Find the budget constraint and consumer equilibrium. Also indicate
 - (a) the quantity of x the consumer could purchase, if he spent all his income on x and
 - (b) the quantity of y the consumer could purchase, if he spent all his income on y.
5. Determine the maxima or minima for the following function.
 $f(x_1, x_2, x_3) = x_1^2 + 2x_2^2 + x_3^2 + x_1x_2 - 2x_3 - 7x_1 + 12.$
6. A manufacturer produces bicycles and motor scooters, each of which must be processed through two machine centers. Machine center 1 has a maximum of 120 hours available and machine center 2 has a maximum of 180 hours available. Manufacturing a bicycle requires 6 hours in machine center 1 and 3 hours in machine center 2; manufacturing a motor scooter requires 4 hours in machine center 1 and 10 hours in machine center 2. If profit is Rs.45 for a bicycle and Rs.55 for a motor scooter, graphically determine the number of bicycles and the number of motor scooters that should be manufactured in order to maximize profit.
7. If the demand and supply functions are $P_d = -50q + 200$ and $P_s = 10q + 500$, obtain consumer's surplus and producer's surplus.

SECTION – B

ANSWER ANY THREE QUESTIONS:

(3x20=60)

8. Given the input-output coefficient matrix A and the final demand vector D.

$$A = \begin{bmatrix} 0.0 & 0.3 & 0.3 \\ 0.3 & 0.1 & 0.1 \\ 0.2 & 0.4 & 0.0 \end{bmatrix}, \quad D = \begin{bmatrix} 200 \\ 50 \\ 100 \end{bmatrix}$$

- (a) Write the set of balancing equations.
 - (b) Compute the output levels of the three industries.
 - (c) Test the Hawkins-Simon conditions for the viability of the system.
 - (d) Write down the input-output matrix for the three industries.
9. (a) Explain the properties of linear homogeneous production function.
 (b) Prove that under conditions of constant returns to scale the total product will get exhausted if each factor is paid according to its marginal product.
10. Determine the maximum of the following function using Langrange multiplier:
 $f(x, y, z) = -x^2 - 2y^2 - z^2 + xy + z$, if $x + y + z = 35$.
11. A company produces two commodities in quantities x_1 and x_2 , respectively and wishes to minimize cost $C = 2x_1 + 10x_2$
 Subject to: $2x_1 + x_2 \leq 6$
 $5x_1 + 4x_2 \geq 20$
 and $x_1, x_2 \geq 0$
 Using Simplex method determine the optimal quantities each commodity to be produced and the associated cost.
12. Illustrate the use of second order difference equation in Samuelson's Multiplier-Accelerator interaction model.
