STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 86
(For Candidates admitted during the academic year 2011 – 2012)

SUBJECT CODE: 11EC/PE/MM34

M.A. DEGREE EXAMINATION NOVEMBER 2012
BRANCH III – ECONOMICS
THIRD SEMESTER

COURSE : ELECTIVE
PAPER : MATHEMATICAL METHODS
TIME : 3 HOURS **MAX.MARKS : 100**

SECTION – A

ANSWER ANY FIVE QUESTIONS. EACH ANSWER NOT TO EXCEED 300 WORDS: (5 X 8 = 40)

1.a. Define the derivative of a function $y = f(n)$ and state the product rule and quotient rule.

b. If $y = (\log x)^2$ show that $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx}$=2.

2. Optimize the utility function $U = 4xy - y^2$ subject to the budget constraint $2x + y = 6$.

3.a. If $A = \begin{bmatrix} 5 & 4 & -2 \\ 4 & 5 & -2 \\ -2 & -2 & 2 \end{bmatrix}$ show that A satisfies the equation $(A - 10I)(A - I) = 0$

b. Define the rank of a matrix and find the same for
$\begin{bmatrix} 2 & 1 & -1 \\ 0 & 3 & -2 \\ 2 & 4 & -3 \end{bmatrix}$

4.a. Evaluate $\int \frac{x+1}{(x+5)(x-1)}\, dx$.

b. If the demand law of a consumer is $p = 45 - 2x - x^2$ and he produces 5 units find the consumer's surplus.

5. Solve the difference equation $Y_{t+2} - 6Y_{t+1} + 8Y_t = 2$ and discuss the nature of the time path.

6. Solve using Cramer's rule
$2x + 4y + z = 5$
$x + y + z = 6$
$2x + 3y + z = 6$

7. Solve the following linear programming problem by the graphical method

Maximize $f(P,Q) = 2P + 3Q$

Subject to $P + Q \geq 6$
$2P + Q \geq 7$
$P + 4Q \geq 8$
$P, Q \geq 0$

SECTION – B

ANSWER ANY THREE QUESTIONS: EACH ANSWER NOT TO EXCEED 1200 WORDS: (3 X 20 = 60)

8.a. Define maximum and minimum of a function and give the conditions to identify them.

b. A monopolist manufacturer has developed a new design for solar collection panels. Marketing studies have indicated that annual demand for the panels will depend on the price charged. The demand function for the panels has been estimated as $q = 2{,}50{,}000 - 2p$ where q equals the number of units demanded each year and p equals the price in rupees. Engineering studies indicate that the total cost of producing of panels is represented by the function $C = 5{,}00{,}000 + 250q + 0.003q^2$. Determine the profit maximizing level of output, price per panels and the maximum profit.

9.a. What are homogeneous functions? State Euler's theorem and give its economic interpretation.

b. The production function of a firm is given by $Q = 8LK - L^2 - K^2 (L, K > 0)$. Find the marginal productions ties of labour L and Capital K. Show that

$$L\frac{\partial Q}{\partial L} + K\frac{\partial Q}{\partial K} = 2Q.$$

10.a. Distinguish between an open and closed input and output model and find the solution of a three sectors open model.

b. From the following coefficient matrix find out the final output goods of each industry assuming that the consumer output targets are Rs.80 million in steel, Rs.300 million in coal, and Rs.50 million in railway transport. What would be the labour requirements of each sector?

	Steel	Coal	Railway transport
Steel	0.3	0.2	0.2
Coal	0.2	0.1	0.2
Railway Transport	0.2	0.4	0.2
Labour	0.3	0.3	0.1

11. Outline the Cobweb model as an application of first order difference equation.

12. Maximize $f(x,y) = 5x + 8y$

Subject to $5x + 6y \leq 74$
$x + 2y \leq 22$
$4x + y \leq 14$
$x, y \geq 0$

Use the method of Simplex.

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