STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86
(For candidates admitted during the academic year 2004–05 & thereafter)

SUBJECT CODE : EC/PE/MM24

M. A. DEGREE EXAMINATION, APRIL 2008
BRANCH III – ECONOMICS
SECOND SEMESTER

COURSE : ELECTIVES
PAPER : MATHEMATICAL METHODS - II
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

ANSWER ANY FIVE QUESTIONS. **(5 X 8 = 40)**

1. a) Distinguish between column matrix and row vector.

b) Given $A = \begin{bmatrix} 7 & 10 & 14 \\ 9 & 2 & 6 \\ 1 & 3 & 7 \end{bmatrix}$ $B = \begin{bmatrix} 5 & 12 \\ 20 & 4 \end{bmatrix}$ $N = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

$$I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

Show that (i) multiplication by an identity matrix leaves the original matrix unchanged
(ii) multiplication by a null matrix produces a null matrix.
(iii) addition or subtraction of a null matrix leaves the original matrix unchanged.

2. a) Define Idempotent matrix.

b) Find the rank of the matrix $A = \begin{bmatrix} 1 & 3 & 4 & -2 \\ 2 & 6 & 8 & -4 \\ 3 & 0 & 3 & 3 \end{bmatrix}$

3. a) What is the Trace of a matrix

b) Prove that $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$.

4. Given $A = \begin{bmatrix} 6 & 6 \\ 6 & -3 \end{bmatrix}$

Find a) the characteristic roots
b) the characteristic vectors.

5. For the data given below, determine
   a) the market price p_t in any time period
   b) the equalibrium price p_e and
   c) the stability of the time path
   $Q_{dt} = 180 - 0.75 p_t \qquad Q_{st} = -30 + 0.3 p_{t-1} \qquad P_0 = 220$

6. Explain the process of finding solution to an open Input-Output model.

7. Obtain dual of the following LPP
   maximize: $f = 2x_1 + 3x_2$
   subject to: $x_1 + 3x_2 \le 12$
   $2x_1 + x_2 \ge 6$
   $x_1 + 5x_2 = 10$
   and $x_1, x_2 \ge 0$.

SECTION – B

ANSWER ANY THREE QUESTIONS (3 X 20 = 60)

8. a) Compute the inverse of the matrix $A = \begin{bmatrix} 4 & 1 & -5 \\ -2 & 3 & 1 \\ 3 & -1 & 4 \end{bmatrix}$

   b) Solve the following system of equations by Cramer's Rule

   $0.4Y + 150i = 209$
   $0.1Y - 250i = 35$

9. Determine the total demand x for industries 1, 2 and 3, given the matrix of technical co-efficient A and the final demand vector B.

$$A = \begin{bmatrix} 0.3 & 0.4 & 0.1 \\ 0.5 & 0.2 & 0.6 \\ 0.1 & 0.3 & 0.1 \end{bmatrix} \qquad B = \begin{bmatrix} 20 \\ 10 \\ 30 \end{bmatrix}$$

10. a) Find the particular solution for each of the following equations
   1) $y_t - 10y_{t-1} + 16y_{t-2} = 14$
   2) $y_t - 6y_{t-1} + 5y_{t-2} = 12$
   3) $y_t - 2y_{t-1} + y_{t-2} = 8$

b) In Samuelson's interaction model between the multiplier and the accelerator assume: $Y_t = C_t + I_t + G_t$

$$C_t = C_0 + cY_{t-1}$$
$$I_t = I_0 + w(C_t - C_{t-1})$$

where $0 < c < 1$, $w > 0$ and $G_t = G_0$

i) Find the particular solution and

ii) Find the characteristic roots for the complementary function.

11. Solve the following LPP by simplex method

Minimize: $f = 9X + 12Y + 15Z$

Subject to $2X + 2Y + Z \geq 10$

$2X + 3Y + Z \geq 12$

$X + Y + 5Z \geq 14$

$X, Y, Z \geq 0$.

12. a) Distinguish between a game and a strategy

b) Write a short note on saddle point

c) Given $A = \begin{bmatrix} 1 & 7 & 2 \\ 6 & 2 & 7 \\ 5 & 1 & 6 \end{bmatrix}$

i) Find maximin and minimax

ii) Is there a saddle point?

iii) What is A's expected pay off?

iv) What is B's expected pay off?

v) What is the expected value of the game?