STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86
(For candidates admitted from the academic year 2004 – 2005 & thereafter)

SUBJECT CODE : EC/MC/MM44

B. A. DEGREE EXAMINATION, APRIL 2008
BRANCH IV - ECONOMICS
FOURTH SEMESTER

COURSE : MAJOR – CORE
PAPER : MATHEMATICAL METHODS – II
TIME : 3 HOURS. MAX. MARKS : 100

SECTION – A

ANSWER ALL QUESTIONS. EACH ANSWER NOT TO EXCEED 50 WORDS: (10 X 3 = 30)

1. Define Matrix. What is order of a matrix?
2. Distinguish between trace of a square matrix and trace of an Identity Matrix.
3. If $A = \begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$. Find the matrix X such that 3A+5B+2X=0.
4. Prove $(AB)' = B'A'$ with suitable example.
5. What is the co-factor of an element (a_1) in the third order determinant of the matrix.
6. Differentiate between closed and open Input-Output Models.
7. Test the viability of technology matrix:

	Steel	Coal	Final demand
Steel	0.4	0.1	50
Coal	0.7	0.6	100
Labour	5	2	

8. Distinguish between structured constraints and non-negativity constraints in the LPP.
9. Define convex sets.
10. What is simplex method?

SECTION – B

ANSWER ANY FIVE QUESTIONS. EACH ANSWER NOT TO EXCEED 300 WORDS. (5 X 6 = 30)

11. Suppose three industries A, B & C intend to produce some machines. They find that prices of the different items like bolts, nuts and screw to assemble machines at a particular firm are as follows.
(a) Rs 20 per Bolt (b) Rs 30 per nut & (c) Rs 30 per screw Industries A, B & C wish to order the different items as follows.

	Bolts	Nuts	Screws
A	2	2	3
B	3	3	3
C	4	4	2

How much will they have to pay for this whole lot?

12. Prove the following determinant without expanding:

$$\begin{vmatrix} 38 & 34 & 30 \\ 18 & 16 & 14 \\ 2 & 2 & 2 \end{vmatrix} = 0$$

..2

13. Find the value of $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$

14. Find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & 5 \\ 1 & 5 & 12 \end{bmatrix}$

15. Explain the Cramer's Rule with suitable illustration.

16. Explain the co-efficient matrix of an open input-output model in value terms.

17. A farmer produces 2 products A and B with unit profits of Rs. 6 and Rs. 3 respectively. These products require two types of fertilisers and the total available quantities of fertiliser are 60kg of fertiliser I and 200kg of fertiliser II. 2 units of F_1 and 4 units of F_2 are required to produce A and ¼ units of F_1 and 2 units of F_2 are required to produce B.
Write out a complete linear programming formulation (fertiliser I: F_1; fertiliser II ; F_2)

SECTION – C

ANSWER ANY TWO QUESTIONS. EACH ANSWER NOT TO EXCEED 1,200 WORDS (2 X 20 =40)

18. a) Define (i) Diagonal matrix (ii) Identity matrix (iii) Triangular matrix (iv) Symmetric matrix (v) Idempotent matrix (10)

b) If $A = \begin{pmatrix} 2 & 3 \\ 4 & 5 \end{pmatrix}$ $B = \begin{pmatrix} 3 & 1 \\ 2 & 5 \end{pmatrix}$ and $C = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

find (i) AB (ii) AB' (iii) $A'B'$
(iv) $(AB)'$ (v) $(A+B)'$ (vi) $(ABC)'$
(10)

19. Solve for x, y and z from the following set of equations by inverse matrix method.
$x - 2y + 3z = 1$
$3x - y + 4z = 3$
$2x + y - 2z = -1$

20. Solve the following Linear Programming problem by simplex method.
Maximize $Z = 20X_1 + 25X_2$
Subject to $12X_1 + 16X_2 \le 100$
$16X_1 + 8X_2 \le 80$
$X_1, X_2 \ge 0$.

21. From the following matrix, find the final output goals of each industry assuming that the consumer output target are Rs.85 million in steel, Rs.25 million in coal and Rs.55 in railway transport.

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

What would be the labour requirements of the final outputs of three industries?

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