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 2007
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 Idempotent Matrix with a suitable example.
2. Distinguish between diagonal matrix and Identity matrix.
3. If $A = \begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}$ find 3A + 5 B.
4. Find the value of the determinant
$$\begin{vmatrix} 3 & 4 & 8 \\ 2 & 1 & 3 \\ 7 & -2 & 0 \end{vmatrix}$$
5. Find adjoint of matrix A
$$\begin{bmatrix} 11 & -7 & 2 \\ -9 & 9 & -3 \\ 7 & -2 & 0 \end{bmatrix}$$
6. Write any three assumptions of Input – Output analysis.
7. State the Hawkins – Simon Conditions.
8. Define Linear Programming.
9. What is meant by non-negativity Constraints.
10. Define Convex sets.

SECTION – B

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

11. $A = \begin{bmatrix} 2 & 3 & -1 \\ 3 & 0 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$ $C = \begin{bmatrix} 1 & -2 \end{bmatrix}$

    Verify that $AB(C) = A(BC)$
12. Explain the properties of Determinants with suitable examples.
13. A Company produces three products every day. Their total production on a certain day is 45 tons. It is found that the production of the third product exceeds the production of the first product by 8 tons, while the total production of the first and third product is twice the production of the second product. Determine the production level of each product using Cramer's rule.
14. Determine the value of x and y that minimize the function Z = 20x +40y

    Subject to $36x + 6y \geq 108$
    $3x + 12y \geq 36$
    $20x + 10y \geq 100$
    $x \geq 0$ and $y \geq 0$

15. If $A = \begin{pmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{pmatrix}$ show that $A^3 - 3A^2 - A + 9I = 0$

16. Solve for x,y,z from the following set of equations by matrix method

$$x - 2y + 3z = 1$$
$$3x - y + 4z = 3$$
$$2x + y - 2z = -1$$

17. The following inter-industry transaction table was constructed for an economy

Industry	1	2	Final Consumption	Total
1	500	1,600	400	2,500
2	1,750	1,600	4,650	8,000
Labour	250	4,800	-	5,050
Total	2,500	8,000	5,050	15,550

Construct technology co-efficient matrix showing direct requirements. Does a solution exist for this system?

SECTION – C

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

18. Find the inverse of

$$A = \begin{bmatrix} 1 & 4 & 3 \\ 4 & 2 & 1 \\ 3 & 2 & 2 \end{bmatrix}$$

19. (a) Verify that $B'A' = (AB)'$ when

$$A = \begin{bmatrix} 1 & 1 & 2 \\ 2 & 1 & 0 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 2 \\ 2 & 0 \\ -1 & 1 \end{bmatrix}$$

(b) $A = \begin{bmatrix} 2 & -3 & 1 \\ 4 & 2 & 3 \end{bmatrix}$ $B = \begin{bmatrix} 3 & -2 & 4 \\ 1 & 3 & -5 \end{bmatrix}$ $(A+B)' = A' + B'$

20. 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 tonne of steel. Similarly 0.1 tonne of steel and 0.6 tonne of coal are required to produce a tonne of coal. No capital inputs are needed. Do you think that the system is viable? 2 and 5 labuor days are required to produce a tonne of coal and steel respectively. If the economy needs 100 tonnes of coal and 50 tonnes of steel. Calculate the gross output of the two commodities and the total labour required.

21. Solve the following Linear Programming by simplex method.

Maximise $Z = 4x_1 + 3x_2$

Subject to the constraints

$$2x_1 + x_2 \leq 10$$
$$3x_1 + 2x_2 \leq 16$$
$$x_1 \geq 0, \; x_2 \geq 0$$

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