

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86  
(For candidates admitted from the academic year 2011– 2012)

SUBJECT CODE: 11EC/MC/MM24

B. A. DEGREE EXAMINATION, APRIL 2012  
BRANCH IV - ECONOMICS  
SECOND SEMESTER

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

SECTION – A

ANSWER ALL QUESTIONS. EACH ANSWER NOT TO EXCEED 50  
WORDS: (10 X 2 = 20)

1. Evaluate  $\begin{vmatrix} 1 & 18 & 72 \\ 2 & 40 & 148 \\ 2 & 45 & 150 \end{vmatrix}$

2. If any two rows or columns of a determinant are identical the value of the determinant is zero. Illustrate by a numerical example of a third order determinant.

3. If  $A = \begin{bmatrix} 2 & -1 & 3 \\ 4 & 2 & 0 \\ -2 & 7 & 3 \end{bmatrix}$   $B = \begin{bmatrix} 6 & -2 & 7 \\ 5 & 0 & 9 \\ 3 & 1 & -5 \end{bmatrix}$   
Find  $2A - 5B$ .

4. If  $A = \begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & 3 \end{bmatrix}$   $B = \begin{bmatrix} 3 & 1 \\ 2 & 2 \\ 2 & 3 \end{bmatrix}$   
Show that  $(AB)^T = B^T A^T$ .

5. State Hawkin Simon conditions for the validity of the system.

6. In an economy of two industries A and B the data is given below in millions of rupees

|          | Purchase by |    | Final Demand | Total output |
|----------|-------------|----|--------------|--------------|
|          | A           | B  |              |              |
| Sales by | A           | 12 | 6            | 24           |
|          | B           | 6  | 3            | 18           |

Find the reduce logical coefficient matrix.

7. Define objective function and feasible region.

8. Production of a certain chemical mixture should contain 80mg chlorides, 28 mg nitrates and 36 mg of sulphate per kilogram. The company can use two substances and a base which is costless. Substance X contains 8mg chlorides, 4mg nitrates and 6 mg sulphates per gram. Substance Y contains 10mg chlorides, 2mg nitrates and 2mg sulphates per gram. Both substances cost Rs.20 per gram. It is required to produce the mixture using substances X and Y so that the cost is minimum. Formulate the Linear Programming

9. What are dominated strategies? Give example.
10. Given that the game is a constant sum game with the pay off's of the players adding upto 12 and the pay off matrix of A as  $\begin{bmatrix} 3 & 7 & 4 \\ 5 & 1 & 6 \end{bmatrix}$   
Find the pay off of player B.

### SECTION – B

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

11. Solve using Cramel's rule

$$\begin{aligned} 2x + 3y + z &= 7 \\ 2x + y - z &= 1 \\ 4y + 3z &= -11 \end{aligned}$$

12. A manufacturer sells three products P,Q,R which he sells in two markets. Actual sales volumes as indicated as follows

|         |    | Products |       |        |
|---------|----|----------|-------|--------|
|         |    | P        | Q     | R      |
| Markets | I  | 10,000   | 2000  | 18,000 |
|         | II | 6000     | 20000 | 8000   |

The unit sales prices of P,Q, R are Rs.2.50, Rs.1.25 and Rs.1.50 respectively. Find the total revenue in each market using matrices.

13. Define Idempotent and nilpotent matrices. Show that

$$A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix} \text{ is idempotent.}$$

14. What are Convex sets? Give both the geometrical and algebraic definitions. Bring out its significance in linear programming.
15. A diet for a sick person must contain atleast 4000 units of vitamins, 50 units of minerals and 1400 calories.  
Two foods A and B are available at a cost of Rs.4 and Rs.3 per unit respectively. If one unit of A contains 200 units of vitamins, 1 unit of mineral and 40 calories, and one unit of food B contains 100 units of vitamins, 2 units of minerals and 40 calories. What combination of foods be used to have least cost.

16. Define open and closed Input Output models and find the solution of a three sector open model.

17. Define the following a) game b) strategy c) saddle point  
Explain the method of solution of pure strategy game and solve

$$\begin{bmatrix} -2 & 0 & 0 & 5 & 3 \\ 4 & 2 & 1 & 2 & 5 \\ -4 & -3 & 0 & -3 & 6 \\ 5 & 1 & -5 & -2 & -6 \end{bmatrix}$$

## SECTION – C

ANSWER ANY TWO QUESTIONS. EACH ANSWER NOT TO EXCEED  
1200 WORDS (2 X 20 =40)

- 18.a. If any two rows or columns of a determinant are interchange of the value of the determinant  $\cap^\circ$  obtained is the negative of the value of the original determinant. Prove.

b. Show that 
$$\begin{vmatrix} a + b + 2c & a & b \\ c & b + c + 2a & b \\ c & a & c + a + 2b \end{vmatrix} = 2(a + b + c)^3$$

- 19.a. Define Adjoint and inverse matrices and derive the relationship between them

b. Show that the matrix  $A = \begin{bmatrix} 5 & 3 & 1 \\ 2 & -1 & 2 \\ 4 & 1 & 3 \end{bmatrix}$  satisfies the matrix equation  $A^3 - 7A^2 - 5A + 13I = 0$  and hence find  $A^{-1}$ .

20. Maximize  $Z = 2X + 5Y$

Subject to  $X + 4Y \leq 24$   
 $3X + Y \leq 21$   
 $X + Y \leq 9$   
 $X, Y \geq 0$

Use the method of simplex.

21. Given the technological coefficient matrix of a Leontief's Input Output model as

$$A = \begin{bmatrix} 0.4 & 0.1 & 0.2 \\ 0.1 & 0.3 & 0.3 \\ 0.2 & 0.1 & 0.2 \end{bmatrix} \text{ and the domestic consumption}$$

$$\text{Vector } D = \begin{bmatrix} 10 \\ 20 \\ 10 \end{bmatrix}$$

Test the Hawkin's Simon conditions for the viability of the system and obtain the gross output vector X constant with the given vector D.

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