

**SECOND SEMESTER B.Sc. DEGREE EXAMINATION**  
**MATHEMATICAL ECONOMICS (COMPLEMENTARY COURSE)**  
**ME2C02: MATHEMATICAL ECONOMICS**  
**Model Question Paper I**

Time: 3 hrs.

Maximum Weightage: 30

**I. Objective type questions. Answer all 12 questions (12 x ¼ = 3 weightage)**

1. As income becomes more unequal, the Gini ratio is equal to:  
 (a) 0 (b) 1 (c) between 0 & 1 (d) between 0 & ∞
2. If a constraint is of " $\leq$ " type, it can be converted to equality by adding.  
 (a) slack variable (b) surplus variable  
 (c) artificial variab (d) basic variable
3. In the input - output analysis, the production of each sector is subject to  
 (a) increasing returns to scale (b) diminishing return to scale  
 (c) constant returns to scale (d) none of these
4. A game is said to be fair, if the value of the game is  
 (a) one (b) zero (c) two (d) a constant
5. For a system of m equations and n variables ( $n > m$ ), the number of basic solutions is  
 (a)  $\frac{n!}{m!(n-m)!}$  (b)  $\frac{n!}{m!(m-n)!}$  (c)  $\frac{m!}{n!(n-m)!}$  (d)  $\frac{m!}{n!(m-n)!}$
6. The input-output model which has endogenous final demand vector is known as  
 (a) closed model (b) open model  
 (c) open-closed model (d) dynamic model
7. Every play is associated with an outcome called  
 (a) Strategy (b) pay off  
 (c) saddle point (d) value of game
8. The original problem in an L.P.P. is called .....
9. The order of a pay off matrix can be reduced by the principle of .....
10. Each participant of the game is called .....
11. The gap between the Lorenz curve and the line of equal distribution is called .....
12. The objective in a linear programming problem is subject to a number of limitations known as .....

**II. Short answer type questions. Answer all 9 questions (9x1 = 9 weightage)**

13. State extreme point theorem.
14. What is degeneracy in LPP?
15. Whata are the Hawkin's - Simon conditions?

16. Define two-person zero sum game.
17. What is an open model?
18. What are the advantages of the dual in LPP?
19. How can we determine the co-efficient of equality using Gini co-efficient?
20. Define pay off matrix and saddle point.
21. What is shadow pricing?

**III. Short essay or paragraph questions. Answer any 5 questions from 7**

**(5 x 2 = 10 weightage)**

22. What are the limitations of input-output analysis?
23. Find the dual of the primal LPP.  
 Maximize  $\pi = 5x_1 + 3x_2$  subject to  $6x_1 + 2x_2 \leq 36$ ,  
 $5x_1 + 5x_2 \leq 40$   
 $2x_1 + 4x_2 \leq 28, x_1, x_2 \geq 0$
24. What are the remedial measures to reduce the income inequality?
25. What are the assumptions of a two person zero sum game?
26. Determine the optimal strategies, saddle point and value of the game for the following pay off matrix.

$$\begin{array}{c} \text{Player } B \\ \text{Player } A \begin{bmatrix} 15 & 2 & 3 \\ 6 & 5 & 7 \\ -7 & 4 & 0 \end{bmatrix} \end{array}$$

27. Explain rectangular game and its graphical solution.
28. Use graphic method to maximize  $\pi = 24x_1 + 8x_2$  subject to  $2x_1 + 5x_2 \leq 40$ ,  
 $4x_1 + x_2 \leq 20$ ,  $10x_1 + 5x_2 \leq 60$ ;  $x_1, x_2 \geq 0$ .

**IV. Essay questions. Answer any 2 questions from 3**

**(2 x 4 = 8 weightage)**

29. Use simplex method to maximize  $\pi = 30x_1 + 24x_2 + 60x_3$  subject to  
 $6x_1 + 3x_2 + 5x_3 \leq 30$   $2x_1 + 2x_2 + 10x_3 \leq 50$ ;  $x_1, x_2, x_3 \geq 0$ . Also determine the shadow prices of the inputs.
30. Explain the structure of an input - output model and what are its assumptions?
31. Explain the probability method of finding the solution of mixed strategy game problem. Solve the following game by the principle of dominance.

$$\begin{array}{c} \text{Player } B \\ \text{Player } A \begin{bmatrix} 8 & 10 & 9 & 14 \\ 10 & 11 & 8 & 12 \\ 13 & 12 & 14 & 13 \end{bmatrix} \end{array}$$

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**Model Question Paper II**

Time: 3 hrs.

Maximum Weightage: 30

**I. Objective type questions. Answer all 12 questions (12 x ¼ = 3 weightage)**

1. The total pattern of choices employed by any player in a game is called  
(a) pay off (b) strategy (c) Value of the game (d) dominance
2. As income becomes more equal, the Gini coefficient is equal to  
(a) 0 (b) 1 (c) 2 (d) between 0 and 1
3. The saddle point solution exists in the case of  
(a) Pure strategy (b) Dominated strategy  
(c) Mixed strategy (d) Both pure and mixed strategy
4. The " $\geq$ " type inequality constraints can be converted to equality by introducing  
(a) Slack Variable (b) Surplus Variable  
(c) Basic Variable (d) Artificial Variable
5. The variables set equal to zero at a particular step of LPP are called  
(a) Non basic variable (b) Basic variable  
(c) Artificial variable (d) Slack variable
6. The input-output model which has exogenous final demand vector is known as  
(a) closed model (b) open model  
(c) open-closed model (d) dynamic model
7. A linear programming problem is called degenerate if  
(a) Gini ratios are equal (b) Displacement ratios are equal  
(c) Input-output ratios are equal (d) none of these
8. Income inequality can be measured graphically by using .....
9. Shadow prices serve the same function as .....
10. The average pay off per play of the game over an extended period of time is called .....
11. The size of the pay off matrix can be reduced by using the principle of .....
12. .... constraints remains the same in the primal and dual problems of an LPP.

**II. Short answer type questions. Answer all 9 questions (9x1 = 9 weightage)**

13. State Basis Theorem
14. When a game is called strictly determinable
15. What is the value of a game?

16. State the Hawkin's - Simon conditions
17. State the dual theorem
18. What are the causes of income inequality?
19. Define Basic and non Basic variable in LPP.
20. What is Lorenz curve?
21. Define Gini ratio.

**III. Short essay or paragraph questions. Answer any 5 questions from 7**

**(5 x 2 = 10 weightage)**

22. Find the range of values of  $p$  and  $q$  which will render the entry  $(2, 2)$  as a saddle point for the game.

$$\text{Player } A \begin{matrix} & \text{Player } B \\ \begin{bmatrix} 2 & 4 & 5 \\ 10 & 7 & q \\ 4 & p & 6 \end{bmatrix} \end{matrix}$$

23. Given the demand  $F_1 = 11$  &  $F_2 = 12$ . Find the solution output mix for the two industries, given the input matrix  $A = \begin{bmatrix} 0.3 & 0.2 \\ 0.2 & 0.1 \end{bmatrix}$ .

24. Explain Leontief production function
25. What are the rules of transformation to obtain the dual of a given LPP?
26. What are the assumptions of game theory?
27. Find the dual of the LPP, maximize  $\pi = 7x_1 + 5x_2$  subject to  $x_1 + 2x_2 \leq 6$ ,  $4x_1 + 3x_2 \leq 12$ ;  $x_1, x_2 \geq 0$ .
28. What are the uses and limitations of Lorenz Curve?

**IV. Essay questions. Answer any 2 questions from 3**

**(2 x 4 = 8 weightage)**

29. (a) Explain open and closed input - output model
- (b) The following table gives the input - output coefficients for a two sector economy consisting of agriculture and manufacturing industry.

Input/Industry	A	M
A	0.10	0.50
M	0.20	0.25

The final demand for the two industries are 300 and 100 units respectively, find the gross outputs of the two industries.

30. Use simplex algorithm to solve the following equations and inequalities.  
Minimize  $C = 4x_1 + 2x_2$  subject to  $4x_1 + x_2 \geq 20$ ;  $x_1 + 6x_2 \geq 18$ ;  $2x_1 + x_2 \geq 14$ ;  $x_1, x_2 \geq 0$ .
31. (a) What is saddle point solutions? Explain with example.
- (b) What are the limitations of game theory?

