2019/EVEN/ECOH–203 (A/B)/167

TDC Even Semester Exam., 2019

ECONOMICS

(Honours)

(2nd Semester)

Course No. : ECOH–203

Full Marks : 50
Pass Marks : 17

Time : 2 hours

The figures in the margin indicate full marks for the questions

Science students will answer Option—A and Arts students will answer Option—B

OPTION—A

(For Science Students)

(ELEMENTS OF MATHEMATICAL ECONOMICS)

Course No. : ECOH–203 (Science)

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. Given

$$A \quad \begin{matrix} 5 & 8 & 6 \\ 12 & 13 & 6 \\ 11 & 10 & 9 \end{matrix}$$

(a) Find maximin and minimax. 4

(b) Is there a saddle point? Which element is it? 2

(c) What are the optimal strategies for the two players? 2

(d) Can you obtain payoff to player 2? 2

2. (a) Explain two-person zero-sum game. 6

(b) What are the limitations of game theory? 4

UNIT—II

3. (a) Given the input coefficient matrix

$$A \quad \begin{matrix} 0\ 4 & 0\ 1 \\ 0\ 7 & 0\ 6 \end{matrix}$$

and output vector

$$x \quad \begin{matrix} 176\ 5 \\ 558\ 8 \end{matrix}$$

(i) Find the gross value added.

(ii) Find the output level disposal to final demand.

(iii) Show that the total disposal to final demand is equal to the total value added. 4+3+1=8

(b) State Hawkins-Simon condition. 2

4. The following table gives the input-output coefficients for a two-sector economy consisting of agriculture and industry :

Input / *Industry*	*A*	*M*
A	0·10	0·50
M	0·20	0·25

and F 300   100

(a) Find the gross outputs of the two industries. 5

(b) If the input coefficients for labour for the two industries are respectively 0·5 and 0·6, then find the total units of labour required. 3

(c) Check Hawkins-Simon condition. 2

UNIT—III

5. Given

$$A \quad \begin{matrix} 0\ 1 & 0\ 3 & 0\ 1 \\ 0 & 0\ 2 & 0\ 2 \\ 0 & 0 & 0\ 3 \end{matrix} \quad \text{and } F \quad \begin{matrix} 20 \\ 0 \\ 100 \end{matrix}$$

(a) Find the output levels for three sectors consistent with the model. 6

(b) Explain economic meaning of third-column sum. 2

(c) Explain economic meaning of first row sum. 2

6. (a) Write a note on dynamic input-output model. 6

(b) Mention the limitations of input-output model. 4

UNIT—IV

7. (a) What are the different components of a linear programming problem? Construct a linear programming problem taking a hypothetical example. 2+3=5

(b) Solve the following linear programming problem by graphic method : 5

Minimize $f \quad 0\ 6x_1 \quad x_2$

subject to

$$10x_1 \quad 4x_2 \quad 20$$
$$5x_1 \quad 5x_2 \quad 20$$
$$2x_1 \quad 6x_2 \quad 12$$
$$x_1, x_2 \quad 0$$

8. (a) Solve the following linear programming problem by simplex method : 6

Maximize $2x_1 \quad 5x_2$

subject to

$$x_1 \quad 4x_2 \quad 24$$
$$3x_1 \quad 4x_2 \quad 21$$
$$x_1 \quad x_2 \quad 9$$

where, $x_1, x_2 \quad 0$

(b) Define the following : 2×2=4

(i) Infeasibility

(ii) Unbounded solutions

UNIT—V

9. *(a)* Give primal as

Maximize $f \quad 2p_1 \quad 6p_2$

subject to

$$4p_1 \quad p_2 \quad 5$$
$$3p_1 \quad 2p_2 \quad 7$$
$$p_1 \quad p_2 \quad 2$$

and $p_1 \quad 0,\ p_2 \quad 0$

Find the dual of above primal. 3

(b) Define duality. Prove that the dual of the dual is the primal. 2+5=7

10. *(a)* Give economic interpretation of duality taking a hypothetical example. 5

(b) Mention the limitation of linear programming. 5

OPTION—B

(For Arts Students)

(MATHEMATICS FOR ECONOMICS)

Course No. : ECOH–203 (Arts)

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Find the solutions from the following : 3×2=6

(i) $\frac{dy}{dt} \quad 3y \quad 2;\ y(0) \quad 4$

(ii) $\frac{dy}{dt} \quad t^2 y \quad 5t^2;\ y(0) \quad 6$

(b) Derive the following formula using four-step procedure : 4

$$Mdy \quad Ndt \qquad \frac{}{t}\ Mdy\ dt \quad c$$

2. *(a)* Given the demand and supply functions

$$Q_d \qquad p \quad \frac{dp}{dt}$$
$$Q_s \qquad p \quad (\ ,\ ,\ , \qquad 0)$$

and $\frac{dp}{dt} \quad (Q_d \quad Q_s)$

where is the adjustment coefficient. Find the time path of price. 7

(b) What restrictions on the parameter would ensure dynamic stability? 3

UNIT—II

3. *(a)* If the short-run total cost function is

$$C \quad 2Q^3 \quad 15Q^2 \quad 30Q \quad 16$$

then find out the level of output at which AVC is minimum and show that MC = AVC at that level of output. 3+2=5

(b) In a competitive market with demand function $Q_d \quad 30 \quad 3p$ and supply function $Q_s \quad 5 \quad 2p$ respectively. If government imposes a tax t per unit of output, find the value of tax rate which corresponds to maximum total revenue. What will be the equilibrium output after tax? 3+2=5

4. *(a)* If $U \quad x\sqrt{y}$ be a utility function and $4x \quad y \quad 48$ is a budget constraint, then find the equilibrium commodity bundle of x and y. 5

(b) Calculate the elasticity of supply for the following equation at $p \quad 10$: 5

$$S \quad 77 \quad 4p \quad p^2$$

UNIT—III

5. *(a)* Verify whether the following functions are homogeneous : 3×2=6

(i) $f(x, y) \quad \sqrt{xy}$

(ii) $f(x, y) \quad 2x \quad y \quad 3\sqrt{xy}$

(b) State and prove Euler's theorem using a linear homogeneous production function. 4

6. *(a)* Given the production function

$$Q \quad AK \quad L$$

Show that $\quad$ 1 implies increasing returns to scale. 5

(b) Show that the production function

$$Q \quad aK \quad bL$$

which is linearly homogeneous does not possess unitary elasticity of substitution between L and K. 5

UNIT—IV

7. *(a)* Explain the Leontief model of input-output analysis. 7

(b) Verify whether Hawkins-Simon conditions are true for the following technological coefficient matrix : 3

$$A \quad \begin{array}{cc} 0\ 4 & 0\ 1 \\ 0\ 7 & 0\ 6 \end{array}$$

8. Given the input coefficient matrix

$$A \quad \begin{array}{ccc} 0\ 05 & 0\ 25 & 0\ 34 \\ 0\ 33 & 0\ 10 & 0\ 12 \\ 0\ 19 & 0\ 38 & 0 \end{array}$$

and final demand vector

$$D \quad \begin{array}{c} 1800 \\ 200 \\ 900 \end{array}$$

(a) Find the output level. 5

(b) Explain the economic meaning of the elements 0·33 and 200. 2

(c) Check the Hawkins-Simon conditions for the above. 3

UNIT—V

9. *(a)* Discuss the importance and limitations of input-output analysis. 3+3=6

(b) Find the gross value added from the technological coefficient matrix

$$A \quad \begin{array}{ccc} 0\ 2 & 0\ 3 & 0\ 2 \\ 0\ 4 & 0\ 1 & 0\ 2 \\ 0\ 1 & 0\ 3 & 0\ 3 \end{array}$$

and output vector

$$X \quad \begin{array}{c} 25 \\ 21 \\ 18 \end{array}$$

4

10. *(a)* How is closed Leontief input-output model different from the open model? 4

(b) Find the final demand vector *D* that is consistent with output vector

$$X \quad \begin{array}{c} 2091 \\ 2270 \\ 1699 \end{array}$$

when the input coefficient matrix is the following :

$$A \quad \begin{array}{ccc} 0\ 3 & 0\ 2 & 0\ 3 \\ 0\ 1 & 0\ 3 & 0\ 4 \\ 0\ 2 & 0\ 3 & 0 \end{array}$$

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