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PG Even Semester (CBCS) Exam., May—2018

ECONOMICS

(4th Semester)

Course No. : ECOCC–405

(Mathematical Economics—II)

$\dfrac{\textit{Full Marks} : 70}{\textit{Pass Marks} : 28}$

Time : 3 hours

The figures in the margin indicate full marks
for the questions

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

UNIT—I

1. *(a)* Introduce slack, surplus and artificial variables in the following system of constraints to find an initial basic feasible solution : 2×2=4

(i) $3x_1 \quad x_2 \quad 5$
  $2x_1 \quad x_2 \quad 1, (x_1, x_2) \quad (0,0)$

(ii) $3x_1 \quad 7x_2 \quad 5$
  $x_1 \quad x_2 \quad 2, (x_1, x_2) \quad (0,0)$

(b) Write down the dual of the following LPP and express the same in standard form : 4

Max. $2x_1 \quad 6x_2$

subject to

$$x_1 \quad 3x_2 \quad 6$$
$$2x_1 \quad 4x_2 \quad 8$$
$$x_1 \quad 3x_2 \quad 6$$

$$(x_1, x_2) \quad (0, 0)$$

(c) Solve the following LPP using simplex algorithm : 6

Max. $60x_1 \quad 50x_2$

subject to

$$x_1 \quad 2x_2 \quad 40$$
$$3x_1 \quad 2x_2 \quad 60$$

$$(x_1, x_2) \quad (0,0)$$

2. Write down the equations of the price and output systems in a standard 2 2 2 general equilibrium model for a small open economy. Examine how FDI inflow influences sectoral outputs in this model. Use linear system of equations to validate your answer.

4+10=14

(3)

UNIT—II

3. *(a)* In the context of optimal control, explain 'control', 'state' and 'co-state variables' with economic examples. 3

(b) What is a Hamiltonian? What are the first-order conditions for maximizing the Hamiltonian? 2

(c) Solve the following optimal control problem : 9

$$\text{Maximise } V \quad \int_0^T (1 \quad u^2)^{\frac{1}{2}} \, dt$$

subject to

$$\dot{y} \quad u, \text{ given } y(0) \quad A \text{ and } y(T).$$

4. Use optimal control to illustrate saddle point equilibrium in the Ramsey-Cass-Koopmans overlapping generations growth model with optimising households and firms. 14

UNIT—III

5. *(a)* Elaborate Hawkins-Simon conditions in a 2 2 Leontief static open model (LSOM). 6

(b) Provide economic interpretation of Hawkins-Simon conditions. 2

(4)

(c) Find analytical expression for a consumption possibility locus in the LSOM. 6

6. *(a)* Introduce price system in a Leontief static closed model (LSCM) and find the conditions for a strictly positive relative price ratio. Provide economic interpretations of these conditions. 8

(b) Provide LPP interpretation of a 2 2 Leontief static open model and derive a dual taking labour cost minimization as a primal. 6
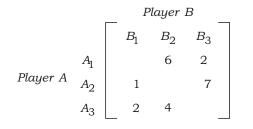
UNIT—IV

7. *(a)* For what value of , is the game with the following pay-off matrix, strictly determinable? 3

Player B

$$\begin{array}{c} \\ A_1 \\ \text{Player A} \quad A_2 \\ A_3 \end{array} \begin{array}{ccc} B_1 & B_2 & B_3 \\ \left[\begin{array}{ccc} & 6 & 2 \\ 1 & & 7 \\ 2 & 4 & \end{array} \right] \end{array}$$

(b) Determine the optimum strategies for the two players X and Y and find the value of the game from the following pay-off matrix : 3

Player Y

		y_1	y_2	y_3	y_4
	x_1	3	1	4	2
Player X	x_2	1	3	7	0
	x_3	4	6	2	9

(c) Solve the following game using dominance principle : 4

Player B

		B_1	B_2	B_3	B_4	B_5
	A_1	3	5	4	9	6
Player A	A_2	5	6	3	7	8
	A_3	8	7	9	8	7
	A_4	4	2	8	5	3

(d) Consider the following duopoly game. Pay-offs are in rupees Lakhs. Here negative sign indicates loss and positive sign indicates profit :

Firm—II

	Cut price 5%	Make no change
Cut price 5%	(80, 60)	(60, 80)
Make no change	(100, 60)	(0, 0)

Firm—I

Use maximin decision rule to solve this game. 4

8. (a) Define the following : 2×4=8

   (i) Game tree

   (ii) Mixed strategy

   (iii) Subgame perfect equilibrium

   (iv) Backward induction method

(b) Consider the following game :

Microcorp's entry decision

		Enter	Stay out
Macrosoft's Ad-campaign	Slick	380, 250	430, 0
	Simple	400, 100	800, 0

Pay-offs are in rupees lakhs and a negative sign implies a loss. Now find the following : 3+3=6

   (i) Solution of this game taking Macrosoft as first mover

   (ii) Subgame perfect equilibrium pointing out the method of solution

UNIT—V

9. (a) "Concavity of a utility function implies risk aversion." Explain. 4

(b) A risk averse individual is offered a choice between a gamble that pays ₹ 1000 with a probability of 25% and ₹ 100 with a probability of 75%, or a cash payment of ₹ 325. Which one would she choose and why? 6

(c) Outline the Allais paradox of choice between gambles. 4

10. Write short notes on any *two* of the following : 7×2=14

(a) Mean-variance utility

(b) Two-period portfolio analysis

(c) Polluter pays principle

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