2019/EVEN/03/10/ECO–405/194

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PG Even Semester (CBCS) Exam., May—2019

ECONOMICS

(4th Semester)

Course No. : ECOCC–405

(Mathematical Economics—II)

Full Marks : 70
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)* Prove that an interior point in the feasible region of an LPP can be expressed as a convex combination of extreme points.

(b) You are given the following LPP :

Minimize $Z \quad 3x_1 \quad 2x_2$

subject to

$$2x_1 \quad x_2 \quad 1$$
$$x_1 \quad 3x_2 \quad 4$$
$$(x_1, x_2) \quad (0, 0)$$

(i) Write down the dual of this problem.

(ii) Express this in standard form and show the initial basic feasible solution (BFS).

(c) Illustrate the concept of BFS on the basis of the following maximization problem :

Maximize $40x_1 \quad 30x_2$

subject to

$$x_1 \quad 16$$
$$x_2 \quad 8$$
$$x_1 \quad 2x_2 \quad 24$$
$$x_1 \quad 0, \; x_2 \quad 0$$

4+(2+2)+6=14

2. *(a)* Distinguish between LPP and NLPP. Solve the following NLPP using some suitable methods :

$$\text{Minimize} \quad C \quad (x_1 \quad 4)^2 \quad (x_2 \quad 4)^2$$

subject to

$$2x_1 \quad 3x_2 \quad 6$$
$$3x_1 \quad 2x_2 \quad 12$$
$$x_1 \quad 0, \; x_2 \quad 0$$

(b) Set up a 2 2 2 standard Heckscher-Ohlin-Samuelson general equilibrium model in linear equations and bring out the Stolper-Samuelson and Rybczynski effects. 6+8=14

UNIT—II

3. *(a)* Distinguish between current value Hamiltonian and present value Hamiltonian in the context of optimal control. What are the first-order conditions for maximizing the functional?

(b) Derive an equation of motion for the current value co-state variable.

(c) Solve the following optimal control problem :

$$\text{Maximize} \quad V \quad {}_0^T \quad (1 \quad u^2)^{1/2} \, dt$$

subject to $\dot{y}(t) \quad u(t)$

Given $u(0) \quad A$ and $y(T)$ free. (2+2)+4+6=14

4. Illustrate the use of control theory to derive an optimal extraction path for an exhaustible resource over a finite time horizon. 14

UNIT—III

5. *(a)* In a 2 2 LSOM, verify whether for the existence of a strictly positive output vector ($X \quad 0$), Solow conditions imply Hawkin-Simon conditions.

(b) Provide economic interpretation of Hawkin-Simon conditions.

(c) Examine whether Hawkin-Simon conditions can be fulfilled even if Solow conditions are not fulfilled. 8+3+3=14

6. *(a)* How is the Leontief static closed model different from the open model?

(b) Can you solve for output quantities uniquely? If not, find the necessary conditions for a strictly positive output ratio in this model.

(c) You are given the following sets of technical coefficient values. Comment on the nature of the outputs in the Leontief system :

(i) a_{11} 0 85, a_{22} 0 8, a_{12} 0 12, a_{21} 0 20

(ii) a_{11} 0 80, a_{22} 0 85, a_{12} 0 10, a_{21} 0 30

2+8+(2+2)=14

UNIT—IV

7. *(a)* What are the Nash equilibria of the following game?

(B)

(A)		*L*	*M*	*R*
	T	3, 3	0, 3	0, 0
	M	3, 0	2, 2	0, 2
	B	0, 0	2, 0	1, 1

(b) Consider the game matrix below and answer the following :

(B)

(A)		*L*	*R*
	T	*a, b*	*c, d*
	B	*e, f*	*g, h*

(i) If (*T*, *L*) is a dominant strategy equilibrium, write down the necessary inequalities.

(ii) If (*T*, *L*) is a Nash equilibrium (NE), what would be the inequalities?

(c) How do you calculate NE in mixed strategies? Calculate NE for the following game :

Column

Row		*L*	*R*
	T	2, 1	0, 0
	B	0, 0	1, 2

4+(2+2)+(2+4)=14

8. *(a)* Analyze the following prisoner's dilemma game under cooperation and defection :

Column

Row		*Coop.*	*Defect.*
	Coop.	3, 3	0, 4
	Defect.	4, 0	1, 1

(b) What are sequential games? For the following game, suppose row moves first and then column reacts. Draw the game tree and solve this by backwards induction.

		Column	
		Left	*Right*
Row	*Top*	1, 9	1, 9
	Bottom	0, 0	2, 1

Does this game have a Nash equilibrium in pure strategies? In this game, what are subgames and subgame perfect equilibria? 4+(2+4+2+2)=14

UNIT—V

9. *(a)* Distinguish between *(i)* risk aversion, *(ii)* risk loving and *(iii)* risk neutrality on the basis of Arrow-Pratt measure of absolute risk aversion.

(b) Suppose the utility functions of wealth are—

(i) $(w) \quad a \; e^{\; bw}, (a, b) \quad 0$

(ii) $(w) \quad a, e^{\; bw}, (a, b) \quad 0$

Comment on the nature of the individuals behaviour regarding risk.

(c) Which utility function below has expected utility property? Explain—

(i) $u \quad 0 \; 8\sqrt{c_1} \quad 0 \; 2 \, c_2$

(ii) $u \quad \frac{1}{2}(0 \; 6\sqrt{c_1} \quad 0 \; 4\sqrt{c_2})$

(d) A person has a utility function of the form $u \quad \sqrt{w}$. He has an initial wealth of ₹ 4. He has a lottery ticket that will be worth ₹ 12 with probability $\frac{1}{2}$ and worth ₹ 0 with probability $\frac{1}{2}$. What is his expected utility? What is the lowest price at which he would part with the ticket? 3+(2+2)+(2+2)+3=14

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

(a) The demand for insurance

(b) VNM expected utility

(c) Optimal Pigovian Tax

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