Indian Institute of Technology Kharagpur

Date: 22/11/2011 (AN) Time: 3 hours Full Marks: 50 No of Students: 24

End-Autumn Semester: 2011-12 Department: HSS Subject No: HS50001

Five-Year Integrated M.Sc. in Economics Subject Name: Advanced Economic Theory

Instruction: Answer all the questions.

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1. Answer the following questions:

(a) Discuss the importance of the assumption of constant returns to scale in Leontief input-output analysis. Show how prices are determined in Leontief input-output system. 4

(b) Define consumption possibility locus. Derive the consumption possibility locus in a two-sector input-output model when two primary factors, viz., land and labour are used in the production process. 4

(c) Consider an economy with n sectors and m primary factors each being limited in supply. Explain how the equilibrium output of various sectors of the economy can be determined by applying the techniques of linear programming. 4

2. (a) Prove that the Hawkins-Simon conditions are necessary and sufficient for positive solutions in an m-sector static Leontief input-output system. 6

(b) Consider the following input-output system:

$$x'(t) - 2x(t) + 3y(t) = 10$$

$$y'(t) - x(t) + 2y(t) = 9$$

Derive the time path of x and y with the initial conditions $x(0) = 8$ and $y(0) = 5$, and examine their nature. 6

(c) Consider an economy where output in different sector is produced not only to satisfy input requirements and final demand but also for capital formation. If time is continuous and final demand of various sectors vary over time, explain how the time path of output of different sectors can be determined. 3

3. (a) Consider the following payoff matrix of player A in a two-person zero-sum game:

Player B

		B_1	B_2	B_3
	A_1	-1	-2	8
Player A	A_2	7	5	1
	A_3	6	0	12

Examine if the game is fair. 2

(b) The payoff matrix of Player A in a two-person zero-sum game is given below:

Player B

		B_1	B_2	B_3
	A_1	-1	1	1
Player A	A_2	2	-2	2
	A_3	3	3	-3

Solve this game problem by using the technique of linear programming. 7

(c) Solve the following game by applying the method of oddments:

		Player B		
		B_1	B_2	B_3
Player A	A_1	3	0	4
	A_2	5	6	1
	A_3	2	8	3

3

4. (a) Consider the following payoff matrix of Player A of a two person zero-sum mixed strategy game:

		Player B		
		B_1	B_2	B_3
Player A	A_1	1	-1	-1
	A_2	-1	-1	3
	A_3	-1	2	-1

Prove that the probability distribution of various strategies of the two players (determined on the basis of equality of expected payoff across alternative strategies) maximizes their expected payoff. 4

(b) Consider a differentiated duopoly where each firm has two strategic options, viz., working independently or collectively in the market. The market demand curve faced by Firm I and Firm II are $Q_1 = 29 - 5P_1 + 4P_2$, and $Q_2 = 16 + 4P_1 - 6P_2$ respectively. The total cost function of Firm I is $C_1 = 5 + Q_1$, whereas that of Firm II is $C_2 = 3 + 2Q_2$. Determine the Nash equilibrium output, price and profit of the two firms. 4

(c) Elucidate the importance of game theory in the bargaining process between the trade union and the management of a firm. 3