2015
[December]
ECONOMICS
Mathematics for Economists

Full Marks: 75; Time: 3 hours
The figures in the margin indicate full marks for the questions

Answer **five** questions, selecting at least **one** from each Credit

CREDIT – I

1.	(a) Discuss the properties of determinants.	6
	(b) Solve the system of equations by Cramer's Rule.	9
	$8X_1 - X_2 = 15$ $X_2 + 5X_3 = 1$ $2X_1 + 3X_3 = 4$	
2.	(a) Find the Eigen values and associated Eigen vectors of the following square matrix:	10
	$A = \begin{pmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{pmatrix}$	
	(b) Prove that for subsets A, B, and C of a universal set $\bigcup$	5
	$(i)\quad (AUB) - C = (A - C)U(B - C)$ $(ii)\quad A - (BUC) = (A - B) \cap (A - C)$	

CREDIT – II

3.	(a) Following are the demand functions of three commodities produced by a discriminating monopolist firm and its cost (C) function:	10

	$4Q_1 = 63 - P_1$; $5Q_2 = 105 - P_2$; $6Q_3 = 75 - P_3$ $and \quad C = 20 + 15Q$	
	If the firm has to maximize its profit (π), then determine the quantities $(Q_1, Q_2 \; and \; Q_3)$ of each product to be produced, the prices $(P_1, P_2 \; and \; P_3)$ of the products to be charged and the maximum level of profit to be earned by the firm.	
	(b) Write a note on properties of linearly homogeneous production function.	5
4.	(a) Solve the following Linear Programming Problem using Simplex Method:	10
	$Maximize \quad \pi = 3X_1 - X_2$ $Subject \;\; to \quad 2X_1 + X_2 \geq 2$ $X_1 + 3X_2 \leq 3$ $0 \leq X_2 \leq 4 \quad \& \quad X_1 \geq 0$	
	(b) Distinguish between homogeneous and homothetic functions. Are homothetic functions always homogeneous? Explain your answer with appropriate examples.	2+3=5
	CREDIT – III	
5.	(a) Derive the time path of investment as envisaged in the Domar model. Why is it termed as a ‘razor’s edge’ time path?	5+3
	(b) Solve:	4+3
	$(i) \; \frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = -10; \; y(0) = 12, \; y'(0) = -2$	
	$(ii) \; \frac{dy}{dt} - 7y = 7; \; y(0) = 7$	
6.	(a) Suppose the demand and supply functions of a particular commodity are:	7+2+1
	$Q_d = \alpha - \beta P$ $Q_s = -\gamma + \delta P \;\; where \;\; \alpha, \beta, \gamma, \delta > 0$	
	Derive the time path of price. Does it tend to converge to the equilibrium price as time passes? What is the requirement for dynamic stability?	
	(b) Write a short note on phase diagram	5
	CREDIT – IV	

7.	(a) Write an explanatory note on Cobweb model.	8
	(b) Given the following demand and supply functions, find inter temporal equilibrium price and determine whether the equilibrium is stable:	7
	$Q_{dt} = 22 - 3P_t$ $Q_{st} = -2 + P_{t-1}$	
8.	(a) Write an explanatory note on market model with inventory.	8
	(b) Solve:	7
	$3Y_{t+2} + \frac{1}{3}Y_t = 30, \ \ given\ Y(0) = 4\ \&\ Y(1) = 3$	