

CHUKA



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**EXAMINATION FOR THE AWARD OF
BACHELOR OF ARTS (ECONOMICS AND SOCIOLOGY), BACHELOR OF SCIENCE
ECONOMICS AND STATISTICS, BACHELOR OF SCIENCE IN AGRICULTURAL
ECONOMICS, BACHELOR OF AGRIBUSINESS MANAGEMENT**

ECON 230/232: MATHEMATICS FOR ECONOMISTS I

STREAMS: BSC (ECON&STAT, ECON SOCI, AGRIC ECON AGBM)

TIME: 2 HOURS

DAY/DATE: WEDNESDAY 12/9/2018

8.30 AM – 10.30 AM

INSTRUCTIONS:

Answer Question One and any other Two Questions

Question 1

(a) Find the transposes of the following matrices

(i) $A = [a_{ij}]_{i,j=1,2,3}$ [2 mark]

(ii) $B = [b_{ij}]_{i,j=1,2,3}$ [2 mark]

(iii) $B = \begin{bmatrix} 3 & 4 & 7 \\ 4 & 1 & 5 \\ 7 & 5 & 6 \end{bmatrix}$ [2 mark]

(iv) $A = [6 \ 57 \ 8]$ [2 mark]

(b) The technological inverse for a three sector economy as well as the planned final demand are given as follows:

$$[I-A]^{-1} = \begin{bmatrix} 2.4 & 0.6 & 0.3 \\ 2.0 & 3.5 & 2.0 \\ 2.5 & 4.0 & 4.5 \end{bmatrix}$$

$$D = \begin{bmatrix} D_1 \\ D_2 \\ D_3 \end{bmatrix} = \begin{bmatrix} 100 \\ 200 \\ 50 \end{bmatrix}$$

Compute sectoral output that will enable the economy to realize the planned final demand.

[4

marks]

(c) You are given the following information about the commodity and money market of a closed economy without government.

(i) The commodity market

○ Consumption function $C = 50 + \frac{2}{5}Y$

○ Investment function $I = 790 - 21R$

(ii) The money market

○ Precautionary and transactions demand for money $M_{DT} = \frac{1}{6}Y$

○ Speculative demand for money $M_{DS} = 1200 - 18r$

(iii) Money supply $M_s = 1250$

Present the above information in matrix format. Find equilibrium “Y” and “r” in the two markets.

[18

marks]

Question Two

(a) Find the derivatives of the following functions:

(i) $Y = e^{4x^5 - 3x^2}$ [2 marks]

(ii) $Z = 7^{y^3 + y^2}$ [2 marks]

(iii) $Y = X^4 3^x$ [2 marks]

(b) Compute the following:

(i) Level of Q at which profits are maximized given the following:

$$TR = 64Q - 0.75Q^2$$

$$TC = Q^2 - 6Q + 7$$

[3 marks]

(ii) The marginal product of labour (MP_L) and marginal product of capital (MP_K) as appropriate.

(a) $Q = AL^3 + \frac{B}{L^2}$ [4 marks]

(b) $Q = 20K^{\frac{3}{4}} - K^{\frac{1}{3}}$ [4 marks]

(c) Find consumption function and the marginal propensity to consume given the following savings function.

$$S = -300 + 0.20Y$$

[3 marks]

Question Three

(a) Determine the value of the slopes of the following functions

(i) $Y = a - bx \quad b < 0$ [1 mark]

(ii) $Y = 3 + cx \quad c < 0$ [1 mark]

(b) An economy is defined by the following structural parameters:

$$Y = C + I + G + X - M$$

$$C = c_0 + c_1 Y$$

$$I = \hat{i}_0 + \hat{i}_1 Y$$

$$M = m_0 + m_1 Y$$

$$G = G_0$$

$$X = X_0$$

(i) Name the endogenous and exogenous parameters in the model. [1 mark]

(ii) What is the difference between c_0 and m_0 and on one hand c_1 and m_1 [1 mark]

(iii) What is the state (surplus? Deficit? Equilibrium) of the balance trade in the economy when:

$$X > M ; X < M ; X = M \quad [3 \text{ marks}]$$

(iv) Find the value of Y in terms of $c_0, c_1, \hat{i}_0, e_1, m_0, m_1, X_0 \wedge G_0$ and denote the value by \hat{Y} . [3 marks]

(v) Find the value of C in terms of $c_0, c_1, \hat{i}_0, e_1, m_0, m_1, X_0 \wedge G_0$. Denote that value by \hat{C} . (clue $\hat{c} = c_0 + c_1 \hat{Y}$ substitute the value of \hat{Y} obtained from (iv) into the expression $\hat{c} = c_0 + c_1 \hat{Y}$) [5 marks]

(vi) Present the above information i.e the structural model in matrix format. State the dimensions of matrix of co-efficient matrix of variables and matrix of constants. [5 marks]

Question Four

(a) Consider the following bivariate cost function:

$$C = 2Q_1^2 - 4Q_1Q_2 + 3Q_2^2 + 17$$

(i) Find the fixed cost (FC) [1 mark]

(ii) The average variable cost with respect to $Q_1 (AVC_1)$ [1 mark]

(iii) The average total cost with respect to $Q_2 (ATC_2)$ [1 mark]

(iv) The average fixed costs with respect to $Q_1 (AFC_1)$ [1 mark]

(b) (i) Solve the following systems of simultaneous equations by substitution method

$$2x + y = 8 \quad \dots\dots (i)$$

$$3x + 2y = -2 \quad \dots\dots (ii)$$

(ii) Consider the following national income model

$$Y = C + I + G$$

$$C = c_o + c_1 Y^d$$

$$Y^d = Y - T$$

$$T = t_o + t_1 Y$$

$$I = I_o$$

$$G = G_o$$

$$c_o = 100; c_1 = 0.8 \quad , \quad I_o = 220, G_o = 300 \quad t_o = 120; t_1 = 0.2$$

(a) What is the difference between c_1 and t_1 c_o and i
 [2 marks]

(b) What happens to Y if:

(i) G_o increases by 50 units? [2 marks]

(ii) Autonomous consumption declines by 50 units. [3 marks]

(iii) Tax rate increases by 10 units [3 marks]

Question Five

(a) Consider the following demand function

$$Q_m = 200 - 3 p_m + 2 p_r + 0.2 Y$$

$$p_m = 10; P_r = 40; Y = 100$$

(i) Find own price elasticity of demand [2 marks]

(ii) Find cross price elasticity of demand and comment on your results. [2 marks]

(iii) Is good Q normal or inferior? Explain [2 marks]

(b) Given the following national income model

$$Y = C + I + G$$

$$C = 100 + 0.5 Y^d$$

$$Y^d = Y - T$$

$$T = 0.2 y$$

$$I = 100$$

$$G = 300$$

(i) Calculate equilibrium income [3 marks]

(ii) Find equilibrium consumption [2 marks]

(iii) Find the following multipliers and interpret your results.

(a) Investment multiplier [3 marks]

(b) Income tax multiplier [3 marks]

(c) Autonomous consumption multiplier [3 marks]

