



UNIVERSITY EXAMINATIONS: 2018/2019
ORDINARY EXAMINATION FOR THE DEGREE OF
BACHELOR OF COMMERCE
CMS 102: MANAGEMENT MATHEMATICS II
(EVENING)

DATE: DECEMBER, 2018

TIME: 2 HOURS

INSTRUCTIONS: Answer Question **ONE** and Any other **TWO** Questions

QUESTION ONE [30 MARKS]

- a) State any two examples where Markov chain can be used. (2 Marks)
- b) Define the following in relation to input output analysis.
- i) Technical coefficients
 - ii) Open input-output model
 - iii) Intermediate demands (3 Marks)
- c) Determine the turning points of the following function.

$$y = 10 + 24x - 9x^2 - 2x^3 \quad (8 \text{ Marks})$$

- d) An Economy has two interrelated industries namely Cocoa and Tea. Cocoa sells off Sh. 800m of what it produces to Tea. Tea uses Sh. 500m of what it produces and sells off Sh. 900m to Cocoa. The final demand for Cocoa is Sh. 200m. The total output for Cocoa and Tea are Sh. 2000m and Sh. 1600m respectively. If the Ministry forecasts that the final demand will increase by 14%, determine the new outputs for Cocoa and Tea. (10 Marks)
- e) The average revenue AR and cost C functions are given by

$$AR = 669 - 2q^2$$

$$C = 100 + 69q$$

Determine the maximum profit. (7 Marks)

QUESTION TWO

- a) State the assumptions of Markov chain. (5 Marks)
- b) The switching patterns of customers visiting supermarkets A, B and C are given below.

	TO		
FROM	A	B	C
A	3500	1200	1600
B	1100	4000	1000
C	1240	1160	4800

- i) Determine the transition matrix for this data. (5 Marks)
- ii) If a customer is in supermarket B in period 1, find the probability of being in supermarket A in period 3. (3 Marks)
- iii) Find the steady state probabilities. (7 Marks)

QUESTION THREE

- a) A Research and Development of King Ltd has established the Company's profit to be dependent on advertising x and storage space y . They have expressed the profit function $P = 560x + 600y - 4x^2 - 3y^2 - 12xy$. Determine the maximum profit and show it is maximum. (10 Marks)
- b) The average revenue $AR = 800 - q$ and marginal cost $MC = 12q + 200$. When 40 units are sold, the total cost is Sh. 18,000. Determine maximum profit. (10 Marks)

QUESTION FOUR

- a) Solve the following simultaneous equations using the matrix inverse method.

$$2a + 3b - c = 13$$

$$a + b + c = 4$$

$$4a - 2c + 3c = 5$$

(8 Marks)

- b) A company has the following demand and cost functions for a particular item:

$$\text{Demand } p = 1200 - 4q^2$$

$$\text{Cost } C = 300 + 648q$$

Where p is price per item and q is the quantity produced and sold. Determine the:

- i) Price and quantity for maximum sales and revenue obtainable. (4 Marks)

ii) Price and quantity for maximum profit and the profit obtainable (4 Marks)

iii) Point elasticity of demand $E = \frac{p}{q} \cdot \frac{dq}{dp}$ at the points of maximum revenue

and profit. Comment on your results from an economic point of view.

(4 Marks)

QUESTION FIVE

a) Define the following:

i) Breakeven point (1 Mark)

ii) Consumers' surplus (2 Marks)

iii) Producers' surplus (2 Marks)

b) Sage Ltd has its revenue function $R = 10q - q^2$ and cost function $C = q + 5$.

Determine the profit between the break even points. (6 Marks)

c) Maximize $z = 88x + 76y - 4x^2 - 2y^2 - 12xy$
s.t $x + 4y = 21$

using Lagrangian method. (6 Marks)

d) The demand function $p = 400 - 4q$. The quantity sold $q_0 = 50$. Determine the

consumers' surplus. (3 Marks)