

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

ODEL

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF
COMMERCE

BCOM 162: BUSINESS MATHEMATICS II

STREAMS: BCOM Y1S2

TIME: 2 HOURS

DAY/DATE: TUESDAY 23/03/2021

8.30 P.M – 10.30 A.M

INSTRUCTIONS:

Answer question one and any other two questions

Do not write on the question paper

QUESTION ONE (30 MARKS)

- (a) Define the following terms as used in probability theory;
- (i) Sample space [2 marks]
 - (ii) Random experiment [2 marks]
 - (iii) Mutually exclusive events [2 marks]
- (b) Explain any two areas of application of calculus. [4 marks]
- (c) An aircraft emerging locator transmitter (ELT) is a device designed to transmit signal in case of crash. Altigauge ltd makes 80% of ELTs, Bryant ltd makes 15% of ELTs while the rest are supplied by Chartair ltd. ELTs made by Altigauge, Bryant and Chartair have 4%, 6% and 9% defects respectively

Required :

- (i) A probability tree diagram illustrating the above scenario. [3 marks]
- (ii) The probability that a randomly picked ELT device will be defective [3 marks]
- (iii) Probability a randomly picked ELT device from either Bryant or Chartair companies is defective. [2 marks]
- (iv) Probability that a randomly picked ELT device was from Bryant given that it was defective. [4 marks]

- (d) Ngano bakery produces two types of cakes namely queen cake and black forest. The cost of producing 10 queen cakes and 8 black forest is ksh 4060. The cost of producing 4 queen cakes and 7 black forests is ksh 2840. Using matrix algebra determine the cost of producing a queen cake and a black forest. [4 marks]
- (e) Distinguish between open and closed Leontief models illustrating where possible. [4 marks]

QUESTION TWO

- (a) Shujaa Ltd deals with a manufacture of a product named “Zed”. The product is produced on order and the company does not keep inventory of the product. The demands function (in thousand shillings) is given by $P = 190 - q$ while the total cost function (in thousand shillings) is given by $TC = q^2 + 10q + 500$ where q is the quantity produced and sold.

Required:

- (i) The total revenue function for the company. [2 marks]
- (ii) The number of units produced so as to maximize profit. [6 marks]
- (iii) Price per unit at the maximum profit. [2 marks]
- (b) Solve by Cramm's rule the following system of linear simultaneous equations .

$$2x + y - 4z = 5$$

$$-2x + 3y + z = 15$$

$$4x - 2y + 3z = 15$$

[6 marks]

- (c) Distinguish between independent and mutually exclusive events as used in probability theory. [4 marks]

QUESTION THREE

- (a) The marginal cost in ‘ksh 000’ incurred in feeding x hundred visitors in a graduation ceremony is given by $\frac{dTc}{dx} = 2x - 50$ and $TC = 300$ when $x = 30$

Required :

- (i) The fixed production cost of feeding the visitors. [4 marks]
- (ii) The value of x that would minimize the total cost of feeding the visitors. [3 marks]
- (b) An economy is based on agriculture, manufacturing and transportation. Each unit of agriculture output requires 0.2 units of its own, 0.2 units of manufacturing and 0.1 units of transportation. A unit of manufacturing output requires 0.2 units of agriculture, 0.4

units of its own and 0.2 units of transportation. A unit of transportation requires 0.1 units of agriculture, 0.1 units of manufacturing and 0.3 units of its own.

Required :

- (i) Derive the technology matrix based on the above information. [3 marks]
 (ii) What production schedule should the economy have to satisfy the consumer demand of 80,60 and 50 units of agriculture, manufacturing and transportation respectively. [10 marks]

QUESTION FOUR

- (a) Discuss 3 types of decision making environment in a business. [6 marks]
 (b) Given that $A = \begin{bmatrix} 3 & -1 \\ 1 & 2 \end{bmatrix}$ find A^{-1} and hence or otherwise find the value of x and y in

$$3x - y = 9$$

$$x + 2y = -4$$

[4 marks]

- (c) An investor has an opportunity of investing in one of the 3 available opportunities A, B and C under 3 demand states; low, medium and high. The following is the payoff table in million shillings for each of the alternatives.

	Alternatives		
	A	B	C
Demand : Low	4500	-6000	-8000
Medium	5000	2000	-4000
High	10000	4000	1000

Advise the investor on the best alternative under the following criteria clearly giving a reason for your advice.

- (i) Maximax criterion [2 marks]
 (ii) Hurwicz criterion ($\alpha = 0.8$) [3 marks]
 (iii) Savage principle [3 marks]
 (iv) Suppose the states of nature are expected to occur with probabilities 0.3, 0.5 and 0.2 for low, medium and high respectively what would have been investment opportunity A's payoff. [2 marks]