

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

CHUKA & THARAKA CAMPUSES

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF PURCHASING AND PROCUREMENT

BCOM 162: BUSINESS MATHEMATICS II

STREAMS: BCOM Y1S2

TIME: 2 HOURS

DAY/DATE: THURSDAY 8/08/2019

8.30 A.M - 10.30 A.M.

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**INSTRUCTIONS:**

- Answer Question ONE and any other TWO questions.
- Do not write anything on the question paper

**QUESTION ONE**

(a) Define the following terms as used in probability;

- (i) Random experiment. [2 Marks]
- (ii) Equiprobable events [2 Marks]
- (iii) Sample space [2 Marks]

(b) Discuss any two areas of application of calculus in a contemporary business society. [4 Marks]

(c) A voter poll is to be taken in 3 states; A, B and C. In state A, 50% of voters support liberal candidates, in State B, 60% of voters support liberal candidate while 35% of state C voters support liberal candidate. Of the total population of voters 40% live in State A, 25% in State B while 35% live in state C.

**Required:**

- (i) Probability tree diagram representing the above scenario. [3 Marks]
- (ii) The probability that a liberal candidate will win. [2 Marks]
- (iii) The probability that a voter supports a liberal candidate given that she lives in state A. [2 Marks]

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- (iv) The probability that a voter lives in state B given that she supports a liberal candidate. [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 Kshs.4,060. The cost of producing 4 queen cakes and 7 black forests is Kshs.2,840. 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) Shunjaa 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 demand 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 crammers rule the following system of linear simultaneous equations;
- $$\begin{aligned} 2x + y - 4z &= 5 \\ -2x + 3y + z &= 15 \\ 4x - 2y + 3z &= 15 \end{aligned}$$
- [6 Marks]
- (c) Distinguish between independent and mutually exclusive events as used in probability theory. [4 Marks]

### QUESTION THREE

- (a) The marginal cost in Kshs.‘000’ incurred in feeding  $x$  hundred visitors in a graduation ceremony is given by  $dTc/dx = 2x - 50$  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 pay off table in Million shillings for each of the alternatives.

		<b>Alternatives</b>		
		<b>A</b>	<b>B</b>	<b>C</b>
Demand:	<b>Low</b>	4,500	-6,000	-8,000
	<b>Medium</b>	5,000	2,000	-4,000
	<b>High</b>	10,000	4,000	1000

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

- (i) Maximas 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 the investment A's payoff. [2 Marks]

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