CHUKA   **UNIVERSITY**

UNIVERSITY EXAMINATION

RESIT/SPECIAL EXAMINATION

FIRST YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF COMMERCE, BACHELOR OF COOPERATIVE MANAGEMENT AND BACHELOR OF ENTREPRENEURSHIP AND ENTERPRISE MANAGEMENT

BCOM 162: BUSINESS MATHEMATICS II

STREAMS:BCOM/BCOP/BEEM Y1S2   **TIME: 2 HOURS**

DAY/DATE: MONDAY 01/11/2021   **8.30 A.M – 10.30 A.M**

INSTRUCTIONS:
Answer Question ONE and any other TWO Questions

QUESTION ONE (30 MARKS)

(a) Explain the following decision environments

  (i)   Uncertain   (2 marks)

  (ii)   Risk   (2 marks)

  (iii)   Certain   (2 marks)

(b) Given the total cost function $C = 0.002 X^3 - 0.04 X^2 + 5 X + 1500$. Determine the second derivative of the total cost with respect to x (4 marks)

(c) A chemical manufacturer must decide whether or not to expand its product line. The possible alternatives available to achieve this objective are
  (i)   Construct a large plant
  (ii)   Construct a small plant
  (iii)   Do nothing

The market for the chemical could either be favourable, neutral or unfavourable with probabilities of 0.5, 0.2 and 0.3 respectively. The payoffs in Ksh.000 associated with the strategies are given in the table below:

	Strategies		
	Large Plant	Small Plant	Do Nothing
Unfavourable	2,000	1,200	1,500
Neutral	1,200	800	1,000
Favourable	1,500	1,000	1,800

Use the table to determine the best alternative using the following criteria

(i) Maximin (3 marks)
(ii) Hurwicz (Take α= 0.75) (3 marks)
(iii) Laplace (3 marks)
(iv) Expected Monetary value (3 marks)

(d) Use method of matrices to solve the following system of simultaneous equations

$5x-6y+4z=15$

$7x+4y-3z=19$

$$2x+y+6z=46$$

(8 markS)

QUESTION TWO (20 MARKS)

(a) Explain two areas of application of calculus (4 marks)
(b) An electronic manufacturer has two lines A and B assembling identical electronic units. During the last eight-hour shift, line A produced 200 units while the line B produced 300 units. It is estimated that 5% of the units assembled on line A and 10% of those assembled on line B are defective. All defective units must be reworked at a significant increase in cost. One unit is selected at random from the 500 units produced.

(i) If it is found to be defective, find the probability that it was assembled on line A. (4 marks)
(ii) Find the probability that the unit is defective given that it was assembled on line B. (4 marks)
(c) An economy has three industries T1, T2 and T3. The industries have the following technology matrix

$$A=\begin{bmatrix} 0.2 & 0.2 & 0.1 \\ 0.2 & 0.4 & 0.1 \\ 0.1 & 0.2 & 0.3 \end{bmatrix}$$

and $D=\begin{bmatrix} 40 \\ 45 \\ 50 \end{bmatrix}$ i.e. the final demand in metric tonnes from sector sector T1, T2 and T3 repectively.

Determine:

(i)   Determine the Leontief inverse matrix $(1-A)^{-1}$ (6 marks)

(ii)   Determine the gross production matrix.   (2 marks)

QUESTION THREE (20 MARKS)

(a) The average cost function for a company is given by $AC=\frac{3}{4}x^2-7x+27$. Find the level of output for which Marginal Cost = Average Cost   (6 marks)

(b) A firm has analyzed their operating conditions, prices and costs and has developed the following functions: Revenue: R = $400Q-4Q^2$ and Marginal Cost: $\frac{dC}{dQ}=$ $2Q+10$ where Q is the number of units sold. The firm will incur a total cost of Sh.30 when there is zero production. The firm wishes to maximize profit. Assume that all output produced is sold.

  (i) What quantity should be sold?   (6 marks)

  (ii) What will be the amount of maximum profit?   (2 marks)

(c) Explain the following probabability terms
  (i)   Random experiment   (2 marks)
  (ii) Sample space   (2 marks)
  (iii) Event   (2 marks)

QUESTION FOUR (20 MARKS)

(a) Explain the difference between open and closed leontief model   (2 marks)

(a) A one-product firm estimates that its daily total cost function (in suitable units) is $c(X)=x^3-6x^2+13x+15$ and its total revenue function is $R(X)=28x$. Find the value of x that maximizes the daily profit and the maximum daily profit. (6 marks)

(b) A milk processing factory is experiencing low output and as a result, the firm's management is considering three courses of action: To arrange for subcontracting (S_1), to begin overtime production (S_2), or to construct new facilities (S_3). The correct choice depends largely upon the future demand, which may be low, medium, or high with respective probabilities as 0.10, 0.50 and 0.40. A cost analysis reveals effect upon the profits (in Ksh.) as shown in the table below:

Demand	Probability	Course of action		
		S_1	S_2	S_3
Low (L)	0.1	10,000	-20,000	150,000
Medium (M)	0.5	50,000	60,000	20,000
High (H)	0.4	50,000	100,000	200,000

Show this decision situation in the form of a decision tree and indicate the most preferred decision and its corresponding expected value.

(12 marks)