THE CATHOLIC UNIVERSITY OF EASTERN AFRICA



# A. M. E. C. E. A

#### MAIN EXAMINATION

P.O. Box 62157 00200 Nairobi - KENYA Telephone: 891601-6 Fax: 254-20-891084 E-mail:academics@cuea.edu

# AUGUST – DECEMBER 2018 TRIMESTER

# FACULTY OF SCIENCE

# DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE

#### **REGULAR PROGRAMME**

#### MAT 437: NUMERICAL ANALYSIS II

Date: DECEMBER 2018Duration: 2 HoursINSTRUCTIONS: Answer Question ONE and any other TWO Questions

Q1.	a)	Solve the following system using Gaussian elimination with p 0.2x + 0.3y + 0.4z = 0.20 0.8x + 0.5y + 0.6z = 0.36	bivoting <b>(8 marks)</b>
	b)	0.7x + 0.6y + 0.5z = 0.34 With, $x^{(0)} = (1 \ 1 \ 1)$ solve the system below to one decimal Jacobi's method. Perform the computations to three decimal $10x_1 + 4x_2 + 5x_3 = 3.3$	
		$2x_1 + 20x_2 + 8x_3 = 6.6$ $5x_1 + 10x_2 + 20x_3 = 8.5$	(9 marks)
	c)	Solve the equations $x + y + 3z = 6$	
		2x+5y+9z = 15 $4x+5y+15z = 29$	
		by LU decomposition using the decomposition	
		$\begin{bmatrix} 1 & 1 & 3 \\ 2 & 5 & 9 \\ 4 & 5 & 15 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 3 & 0 \\ 4 & 1 & 2 \end{bmatrix} \begin{bmatrix} 1 & 1 & 3 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$	(8 marks)

Cuea/ACD/EXM/AUGUST – DECEMBER 2018 / MATHEMATICS AND COMPUTER SCIENCE Page 1

ISO 9001:2008 Certified by the Kenya Bureau of Standards

d) The data below are known to obey a law of the form y = a + bx

(5 marks)

х	1	2	3	4	5
У	0.5	0.8	1.1	1.4	1.7

Find a and b

- Q2. a) A least square line is given by z = a + bx + cy. Derive its normal equations (5 marks)
  - b) Given the data

-4x+3y+3z=-1

Х	1	2	3	4	5
у	0.5	2	4.5	8	12.5

Linearize the function  $y = ax^b$  and find the constants a and b (8 marks)

- c) Find the Tylor series solution of the differential equation  $\frac{dy}{dx}x + y; y(0) = 1$ up to the term in  $x^5$  (7 marks)
- Q3. a) Use improved Euler method to find y at x = 1 in five steps given  $\frac{dy}{dx}x + y; y(0) = 1$ (14 marks)
  - b) Use Crammer's method to find the value of x,y and z in the following system 2x+3y+z=13x-y+2z=8 (6 marks)
- Q4. Use the fourth order Runge Kutta method to find y(1) to 5 decimal place given  $\frac{dy}{dx} = 2x - y; y(0) = 1 \text{ in 5 steps. Compare this solution with the analytical one}$

(20 marks)

Q5. a) Find the eigen values of  $A = \begin{bmatrix} 3 & 2 \\ -1 & 0 \end{bmatrix}$  and the corresponding eigen vectors

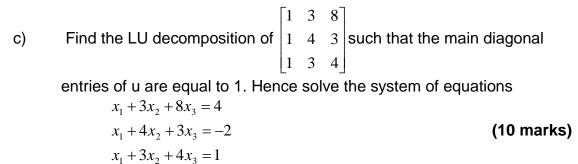
#### (5 marks)

b) Find the least square parabola  $y = a + bz + cx^2$  that best fit the data (5 marks)

х	-2	-1	0	1	2	3
у	-5	0	3	4	3	0

Cuea/ACD/EXM/AUGUST – DECEMBER 2018 / MATHEMATICS AND COMPUTER SCIENCE Page 2

# ISO 9001:2008 Certified by the Kenya Bureau of Standards





ISO 9001:2008 Certified by the Kenya Bureau of Standards