



(University of Choice)  
MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS  
2023/2024 ACADEMIC YEAR  
FIRST YEAR FIRST SEMESTER EXAMINATIONS

FOR THE DEGREE OF  
MASTER OF INDUSTRIAL ENGINEERING AND MANAGEMENT

COURSE CODE: IEM 811

COURSE TITLE: NUMERICAL METHODS

DATE: Monday, 18/12/2023

TIME: 8.00 am- 11.00 am

**INSTRUCTIONS TO CANDIDATES**

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This paper contains THREE questions

Attempt ALL Questions

Requirements: EXCEL or MATLAB software

Save your workings in a SINGLE Workbook, Name it "Your Reg. No.", and submit

Softcopy of the workbook

All abbreviations have their usual meaning in the context of Numerical Methods

TIME: 3 HRS

MMUST observes ZERO tolerance for examination cheating

This Paper Consists of 2 Printed Pages. Please Turn Over. ►

QUESTION ONE

(10 Marks)

Using Newton-Raphson's approach, Compute the roots of the polynomial

$$y = f(x) = x^3 - 7x^2 + 16x - 12$$

for a catalytic evaporative reaction in the sugar industry

QUESTION TWO

(20 Marks)

In an investigation the following data was recorded, however, there is a need to further estimate values of yield strength in the population, and use Lagrange formulae to evaluate yield strength at a compression pressure of 58 bars for the specimen.

Compression pressure	12	22	36	45	78	90
Yield strength GPa	0.3	0.5	0.7	0.9	1.1	1.3

QUESTION THREE

(20 Marks)

Using the Gauss seidel method solve the following equations from three replications in an experiment and state optimal values of x, y and z variables

$$x + y + 54z = 110$$

$$27x + 6y - z = 85$$

$$6x + 15y + 2z = 72$$

QUESTION FOUR

(30 Marks)

The intensity of the gloss (y) of a paint is determined by the additive element (x) ratio plotted from experiment data by the equation below. Use the Taylor series method to obtain the intensity when the ratio is 0.5 correct to four decimal places for  $x_0 = 0.0$ ,  $x_1 = 0.1$ ,  $x_2 = 0.2$ ,  $x_3 = 0.3$ ,  $x_4 = 0.4$  and  $x_5 = 0.5$  with the initial condition  $y(0) = 1$

$$y' = -xy$$