



# TECHNICAL UNIVERSITY OF MOMBASA

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*Faculty of Engineering and Technology in Conjunction with Kenya Institute of  
Highways & Building Technology (KIHBT)*

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

**UNIVERSITY EXAMINATION FOR 2017/2018:**

**HIGHER DIPLOMA IN TECHNOLOGY  
ELECTRICAL POWER ENGINEERING**

**AMA 3250: ENGINEERING MATHEMATICS III**

**END OF SEMESTER EXAMINATION**

**SERIES: DECEMBER 2017**

**TIME: 2 HOURS**

**DATE:** Pick Date Select Month Pick Year

**Instructions to Candidates**

You should have the following for this examination

*-Answer Booklet, examination pass and student I Mathematical table, calculator*

This paper consists of **FIVE** questions. Attempt question **ONE** (Compulsory) and any other **TWO** questions.

**Do not write on the question paper.**

### Question One (Compulsory)

- a. **Table Q1** shows data recorded from an experiment.

**Table Q1**

x	-0.6	-0.4	-0.2	0.0	0.2	0.4	0.6	0.8	1.00
f(x)	-0.576	-0.224	-0.048	0.000	-0.032	-0.096	-0.144	-0.128	0.000

Use Newton – Gregory interpolation formula to determine the value of

i.  $f(-0.36)$

ii.  $f(0.75)$

**(11 marks)**

- b. Given that  $x_n$  is an approximation to the root of the equation  $x^3 - 5x - 40 = 0$ .

Show using the Newton-Raphson method that a better approximation  $x_{n+1}$  is given by

$$x_{n+1} = \frac{2x_n^3 + 40}{3x_n^2 - 5}. \text{ Hence find the root of the equation taking the first approximation}$$

$$x_0 = 4.$$

**(9 marks)**

- c. i) Using Newton Raphson Method, show that if  $x_n$  is an approximation to  $\sqrt[4]{a}$ , then a

better approximation is given by  $x_{n+1} = \frac{1}{4} \left( 3x_n + \frac{a}{x_n^3} \right)$

ii) Hence evaluate  $\sqrt[4]{17}$  correct to 6 d.p

**(10 marks)**

### Question Two

- a. Show that the root of  $e^x = -\frac{1}{2}x - 1$  can be approximated by  $x_{n+1} = \frac{x_n e^{x_n} - e^{x_n} - 1}{e^{x_n} + \frac{1}{2}}$

using the Newton - Raphson method. Hence evaluate the root correct to four d.p. taking  $x_0 = 2.5$

**(8 marks)**

- b. **Table Q2** represents values of x and corresponding values of f(x)

**Table Q2**

x	0	1	2	3	4
f(x)	3	6	11	18	27

- i. Use Newton – Gregory formula to obtain a polynomial that will fit the given data

ii. Hence find  $f(2.8)$

**(12 marks)**

### Question Three

a. Suppose the white cell count of a healthy individual per cubic millimeters of blood is distributed as poisson with parameter  $\mu = 6$ . Find correct to five decimal places the probability that:-

- i) There will be no cells in the blood
- ii) There will be a white cell
- iii) There will be two or more white cells in blood. **(6 marks)**

b. Given the probability density function  $p(x) = \begin{cases} Ae^{-x/\tau} & x \geq 0 \\ 0 & elsewhere \end{cases}$

Find for p(x)

- i. The value of A
- ii.  $E[P(x)]$  **(7 marks)**

The life-time in hours of bulbs from a factory was recorded as follows:-

Life-time (hrs)	60-64	65-69	70-74	75-79	80-84	85-89
Frequency	10	14	26	15	8	9

From the data, determine-

- i. The mean
- ii. Standard Deviations **(7 marks)**

### Question Four

a. Define the following terms:-

- i. Skewness and distinguish between positive and negative Skewness
- ii. Coefficient of dispersion

**(6 marks)**

b. A continuous random variable x has a probability density function  $f(x)$  is defined by

$$f(x) = \begin{cases} \frac{c^2}{2} e^{cx}, & x \geq 0 \\ 0, & elsewhere \end{cases}$$

is a p.d.f

Determine: -

- i. The value of the constant  $c$
- ii. The expected value of  $x$
- iii. The standard deviation  $\sigma$  **(14 marks)**

### Question Five

- a. 120 students perusing a course in electrical engineering were examined and their results summarized as shown in **Table Q5 (a)**.

**Table Q5 (a)**

Marks obtained	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of students	7	12	14	28	25	14	12	8

Using an assumed mean of 55 determine the

- i. Mean mark
  - ii. Standard Deviation
  - iii. Pearson's coefficient of Skewness **(13 marks)**
- b. **Table Q5 (b)** show the percentage mark obtained by ten students in mathematics and physics

**Table Q5 (b)**

Mathematics	75	38	96	27	74	85	90	63	66	42
Physics	85	51	92	60	64	68	88	63	65	45

- i. Determine product correlation coefficient
- ii. Hence comment on the result **(7 marks)**