



TECHNICAL UNIVERSITY OF MOMBASA

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. 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 $p(x) = \begin{cases} Ae^{-x/\tau} & x \geq 0 \\ 0 & \text{elsewhere} \end{cases}$

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)**

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. 120 students perusing a course in electrical engineering were examined and their results summarized as shown in **Table Q2 (a)**.

Table Q2 (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 Q2 (b)** show the percentage mark obtained by ten students in mathematics and physics

Table Q2 (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)**

Question Three

- a. **Table Q3** shows data recorded from an experiment.

Table Q3

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

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

$$x_0 = 4. \quad \textbf{(9 marks)}$$

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

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

is a p.d.f

Determine: -

- i. The value of the constant c
- ii. The expected value of x
- iii. The standard deviation σ

(14 marks)

Question Five

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 Q5** represents values of x and corresponding values of $f(x)$

Table Q5

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 $f(2.8)$

(10 marks)