



---

## TECHNICAL UNIVERSITY OF MOMBASA

---

FACULTY OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONIC ENGINEERING

### UNIVERSITY EXAMINATION FOR:

DIPLOMA IN TECHNOLOGY ELECTRICAL AND ELECTRONIC ENGINEERING

AMA 2150 : ENGINEERING MATHEMATICS I

END OF SEMESTER EXAMINATION

**SERIES : AUGUST 2019**

**TIME: 2 HOURS**

### Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Attempt question ONE and any other TWO Questions

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

---

### QUESTION ONE:

- ( a ) The equation of a straight line, of gradient  $m$  and intercept on the  $y$ -axis  $c$ , is  $y = mx + c$ .  
If a straight line passes through the point where  $x=1$  and  $y=-2$ , and also through the point  
Where  $x=3\frac{1}{2}$  and  $y=10\frac{1}{2}$

find the values of the gradient and the  $y$ -axis intercept.

**( 4 marks )**

- ( b ) Given  $Z1 = 2 + j4$  and  
 $Z2 = 3 - j$

Determine i)  $Z1 + Z2$

ii)  $Z1 - Z2$

iii)  $Z2 - Z1$

and show the results on an Argand diagram.

**( 10 marks )**

(c) i. Evaluate:  $\frac{\log 25 - \log 125 + 1}{3 \log 5}$   $2 \log 625$  ( 4 marks)

ii. Solve the equation  $2^{x+1} = 3^{2x-5}$  correct to 2 decimal places. ( 4 marks)

( d ) Point A lies at co-ordinate (2,3) and point B at (8,7).

Determine

(i) the distance AB,

ii) the gradient of the straight line AB ( 4 marks)

( e ) Use elimination method to solve the simultaneous equations

$$3x+4y = 5$$

$$2x-5y = -12$$
 (4 marks)

### QUESTION TWO:

a) Determine the rate of change of voltage given  $V = st \sin 2t$  volts when  $t = 0.2\text{sec}$  ( 3 marks)

b) Use elimination method to solve the simultaneous equations

$$3x+4y = 5$$

$$2x-5y = -12$$
 (4 marks)

c) The temperature in degrees Celsius and the corresponding values in degrees Fahrenheit are shown in the table below.

*C	10	20	40	60	80	100
*F	50	68	104	140	176	212

(i) Plot the graph .

(3marks)

ii ) From the graph find:-

- I) The temperature in Fahrenheit at 55degrees Celsius.
- II) The temperature in degrees Celsius at 167 degree Fahrenheit.
- III) The Fahrenheit temperature at 0degrees Celsius.
- IV) The Celsius temperature at 230 degrees Fahrenheit.

( 10 marks)

### QUESTION THREE:

a) The resistance  $R\Omega$  of a length of wire at  $t^\circ\text{C}$  is given by  $R = R_0(1+\alpha t)$ , where  $R_0$  is the resistance at  $0^\circ\text{C}$  and  $\alpha$  is the temperature coefficient of resistance in  $^\circ\text{C}$ . Find the values of  $\alpha$  and  $R_0$  if  $R = 30\Omega$  at  $50^\circ\text{C}$  and  $R = 35\Omega$  at  $100^\circ\text{C}$ .

(5 marks)

b) Find the cube root of 1 and show them on an argana diagram.

( 5 marks)

c) Solve triangle XYZ.

Given that  $\angle Y = 128^\circ$ ,  $XY = 7.2$  cm and  $YZ = 4.5$  cm.

(5 marks)

d ) The angle of depression of a ship viewed at a particular instant from the top of a 75m vertical cliff is  $30^\circ$ .

Find the distance of the ship from the base of the cliff at this instant. The ship is sailing away from the cliff at constant speed and 1 minute later its angle of depression from the top of the cliff is  $20^\circ$ . Determine the speed of the ship in km/h.

( 5 marks)

### QUESTION FOUR:

a. Solve the following:

i.  $\frac{2+3i}{1-5i}$

ii.  $\sqrt{-4} \cdot \sqrt{-8}$

iii.  $(2 + 3i)(8 - 7i)$

**(10 marks)**

c ) i. The perimeter of a triangle is 26units , its area is 18.7 units squared, length AB = 12units, BC = 4 units. What is the length of the 3<sup>rd</sup> side CA.

**( 4 marks)**

(ii) If the  $\sin A = 12/37$  find  $\tan A$  in fraction form.

**(3 marks)**

(iii) Convert  $77^\circ 42' 34''$

**(3 marks)**

**QUESTION FIVE:**

(a) Without plotting a graph, determine the gradient and Y – axis intercept values of the following:-

i)  $y = 7x - 3$

**(3 marks)**

ii)  $3y = -6x + 2$

**(3 marks)**

( b ) Solve

(i)  $x^2 + 2x - 8 = 0$  and

(ii)  $3x^2 - 11x - 4 = 0$  by using the quadratic formula

**( 6marks)**

( c ) A surveyor measures the angle of elevation of the top of a perpendicular building as  $19^\circ$  \* he moves 120 m nearer the building & finds the angle of elevation is now  $47^\circ$  \* Determine the height of the building.

**(8marks)**

