



TECHNICAL UNIVERSITY OF MOMBASA
Faculty of Applied & Health
Sciences

UKUNDA CAMPUS

DEPARTMENT OF MATHEMATICS & PHYSICS

CERTIFICATE IN ELECTRICAL POWER ENGINEERING (CEPE II)

AMA 1102: ENGINEERING MATHEMATICS II

END OF SEMESTER EXAMINATION

SERIES: APRIL 2013

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Tables*
- *Non-programmable Calculator*

This paper consist of **FIVE** questions in **TWO** sections **A & B**

Answer question **ONE (COMPULSORY)** and any other **TWO** questions
 Maximum marks for each part of a question are as shown
 This paper consists of **FOUR** printed pages

SECTION A (COMPULSORY)

Question One

- a) Express 120° in radians in terms of π and 1.6 radians in degrees. **(4 marks)**
- b) (i) Find the diameter of a circle if an arc of length 6cm subtends an angle of 2.2 radians at the centre. **(4 marks)**
- (ii) Plot the graph of $y = x^2 - 3x - 4$ and $y = x - 2$ on the same set of axes between $x = -3$ and $x = 5$. Determine the values of x at the point of intersection and give the quadratic equation in x of which these values are the roots. **(10 marks)**
- c) The temperatures of component was monitored at regular interval on 80 occasions. The frequency distribution was as below:

Temperature x (°C)	30.0 – 30.2	30.3 – 30.5	30.6 – 30.8	30.9 – 31.1
Frequency f	6	12	15	?

31.2 – 31.4	31.5 – 31.7	31.8 – 32.0	
13	9	4	

Draw a frequency diagram to represent this information. **(4 marks)**

- d) Express the following in partial fractions:

$$\frac{2x^3 + 3x^2 - 54x + 50}{x^2 + 2x - 24}$$
(8 marks)

SECTION B (Answer any TWO questions from this section)

Question Two

- a) (i) The area of field is in the form of a quadrilateral PQRS as shown in figure 1 below. Determine its area.

Figure 1

(8 marks)

(ii) The value of y ordinates of a curve and their distance x from the origin are given in the table below. Plot the graph and find the area under the curve by mid-ordinate rule.

X	0	1	2	3	4	5	6
Y	2	5	8	11	14	17	20

(6 marks)

- b) (i) Given $\cos(\theta - \phi) = \cos \theta \cos \phi + \sin \theta \sin \phi$ and $\cos 60 = \frac{1}{2}, \cos 45 = \frac{1}{\sqrt{2}}, \sin 60 = \frac{\sqrt{3}}{2}$ and $\sin 45 = \frac{1}{\sqrt{2}}$ express $\frac{\cos 15}{\sec 483^\circ 46'}$ in surd form **(4 marks)**
- (ii) Evaluate and show the quadrant in which it lies on Cartesian plane. **(2 marks)**

Question Three

- a) (i) The angle of elevation from a given point of top of a tower which stands on horizontal ground is 22° . From a point 120m nearer to the tower, the angle of elevation is 44° . Find the height of the tower. **(8 marks)**

$$S = ut + \frac{1}{2} ft^2$$

- (ii) If . Express f in terms of s, u and t **(4 marks)**
- (iii) Prove the following trigonometric identities. **(2 marks)**
- $\sin \theta \sec \theta = \tan \theta$
- (i) $\frac{\operatorname{cosec} \theta + \cot \theta \tan \theta}{\tan \theta + \sec \theta} = \frac{\cos \theta + 1}{\sin \theta + 1}$ **(6 marks)**
- (ii) **(6 marks)**

Question Four

$$\angle C = 69^\circ \quad a = 16.40\text{cm} \quad b = 11.80$$

- a) (i) Solve the triangle ABC given Figure 2 and

C

(5 marks)

(ii) Two sides of an acute angled triangular plot of ground are 48.0m and 6.0m respectively. If the area of the plot is 550m², find the length of the third side and the angles of the triangular plot.

(5 marks)

- b) Express in partial fractions.

$$\frac{42x + 44}{(6x + 5)^2}$$

- (i) (4 marks)

$$\frac{18x^2 + 3x + 6}{(3x + 1)^3}$$

- (ii) (6 marks)

Question Five

- a) Find the length of arc of a circle of radius 4.23cm when the angle subtended at the centre is 1.46 radians. (2 marks)

- b) Prove the following identities:

$$\cos^2 A - \sin^2 A = 2 \cos^2 A - 1$$

- (i) (2 marks)

$$\frac{1 + \tan^2 B}{1 + \cot^2 B} = \tan^2 B$$

- (ii) (2 marks)

- c) (i) Plot the graph of $y = \sin A$ from table of results $(0 - 180^\circ)$ at 15° intervals. (4 marks)

(ii) In a single swing, a pendulum move through an angle of 9° . Determine the length of arc traced by the pendulum bob correct to the nearest centimeters if the length of the pendulum is 1.4m.

(3 marks)

$\sec 1.26\pi$

(iii) Evaluate correct to 4 decimal places

(3 marks)