



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF ELECTRICAL AND ELECTRONIC ENGINEERING

**CERTIFICATE IN ELECTRICAL POWER ENGINEERING (CEPE 2)
CERTIFICATE IN ELECTRICAL AUTOMATION ENGINEERING (CEAE 2)**

CEPE 2/CEAE 2: ENGINEERING MATHEMATICS II

SPECIAL/SUPPLEMENTARY EXAMINATION

SERIES: OCTOBER 2011

TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer booklet*
- *Non-programmable calculator*
- *Mathematical tables*
- *Graph paper*
- *Geometrical set*
- *Non-mobile phones*

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

Maximum marks for each part of a question are clearly shown.

This paper consists of **FOUR** printed pages
SECTION A (COMPULSORY)

Question 1

- a) Express the following angles in radians in terms of π
- 150°
 - 270° (4 marks)

- b) Express the following in partial fractions
- $$\frac{2x^3 + 3x^2 - 54x + 50}{x^2 + 2x - 24}$$
 (8 marks)

- $$\frac{4x - 28}{x - 6x + 8}$$
 (4 marks)

- c) (i) Find the diameter and circumference of a circle if an arc of length 5.67 cm subtends an angle of 2.15 radians (4 marks)

- (ii) Plot the graphs of $y = x^2 - 3x - 4$ and $y = x - 2$ on the same axes between $x = -3$ and $x = 5$. Determine the values of x at the points of intersection and give the quadratic equation in x of which these values are the roots (6 marks)

- (iii) The temperatures of a component was monitored at regular intervals on 80 occasions. The frequency distribution was as follows

Temperature x (°C)	30.0 – 30.2	30.3 – 30.5	30.6 – 30.8	30.9 – 31.1	31.2 – 32.4	31.5 – 31.7	31.8 – 32.0
Frequency	6	12	15	20	13	9	

Draw a frequency histogram to represent this information (4 marks)

SECTION B (Answer any TWO questions from this section - 20 marks each)

Question 2

- a) Prove the following trigonometric identities
- $$\sin \theta \cos \theta = \frac{\sin^2 \theta}{\tan \theta}$$
 (3 marks)

- $$\sin \theta \sec \theta = \tan \theta$$
 (2 marks)

$$\frac{\cos \theta + \tan \theta}{(\tan \theta + \sec \theta)} = \frac{\cos \theta + 1}{\sin \theta + 1}$$

iii.

(3 marks)

- b) (i) The angle of elevation from a given point of the tip 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)

Question 3

- a) (i) Give $\cos(\theta - \phi) = \cos \theta \cos \phi + \sin \theta \sin \phi$ 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 $\cos 14^\circ$ in surd form (4 marks)

- (ii) Evaluate $\sec 483046'$ and show the quadrant on which it lies on cohesion axes (4 marks)

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

Fig 1

- (ii) The values of the 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

Question 4

- a) (i) Find the diameter and circumference of a circle if an arc of length 5.67cm subtends an angle of 2.15 radians (7 marks)

(ii) Prove the following identities

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

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

3. $\sqrt{\frac{1 - \cos C}{1 + \cos C}} = \operatorname{cosec} C - \cot C$ (4 marks)

- b) Plot the graph of $y = \sin A$ from table of results (4 marks)

Question 5

- a) (i) Solve the triangle ABC given $\angle C = 69^\circ$, $a = 16.40\text{cm}$ and $b = 11.80$

A

(5

marks)

- (ii) Two sides of an acute angled triangular plot of ground are 48.0m and 26.0m respectively. If the area of the plot is 550m^2 , find the length of the fluid side and the angles of the triangular plot (5 marks)

b) Express in partial fractions

i. $\frac{42x + 44}{(6x + 5)^2}$ (4 marks)

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