

PAPER 2



TECHNICAL

UNIVERSITY OF

MOMBASA

Faculty of Engineering & Technology

Department of Electrical & Electronics

UNIVERSITY EXAMINATION FOR:

Certificate in Electrical and Electronic Engineering

AMA 1151 ENGINEERING MATHEMATICS II

END OF SEMESTER EXAMINATION

SERIES: December 2016

TIME: Two HOURS

Instructions to Candidates

You should have the following for this examination

Answer Booklet, examination pass and student ID, Scientific Calculator & No Mobile Phone.

This paper consists of five questions. Attempt Question One **COMPULSORY** and any other TWO questions.

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

This paper consists of **THREE** printed pages

Do not write on the question paper.

QUESTION ONE (COMPULSORY)

- (a) Evaluate correct to 2 significant figure

$$\frac{5\sec 29^{\circ}10' - 3\cot 14^{\circ}21'}{2 \operatorname{Cosec} 64^{\circ}8' \tan 23^{\circ}17'} \quad (6 \text{ marks})$$

- (b) Express the following in partial fractions

$$\frac{2x^2 + 6x - 35}{x^2 - x - 12} \quad (6 \text{ marks})$$

- (c) (i) Solve the following trigonometric equation

$$\sin(x + 2) + \sin(x - 2\pi) = \frac{1}{2} \quad (3 \text{ marks})$$

- (ii) The angle of elevation from a given point of the 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 (5 marks)

- (a) Express (-2, -3) in Polar Co-ordinates. (4 marks)

- (b) Find, from first principles, the derivative of the function $f(t) = kt^4$ where k is a constant. (6 marks)

QUESTION TWO:

- (a) (i) The roof of a shed is 3m long and slopes at 20° . What is the depth of the shed from back to front. (3 marks)

(ii) Prove that $\frac{(\operatorname{Cosec}\theta + \cot\theta) \tan\theta}{(\tan\theta + \sec\theta)} = \frac{\cos\theta + 1}{\sin\theta + 1}$ (5 marks)

- (b) Draw up a table of values from which you plot a graph of $y = \tan A$ (4 marks)

(c) (i) Prove that $\frac{1 + \tan^2 B}{1 + \cot^2 B} = \tan^2 B$ (5 marks)

- (ii) An alternating current I amperes at any time t seconds is given by $I = 20 \sin(100\pi t + 0.2)$ the angle being in radians. Find the value of i when $t = 0$ (3 marks)

QUESTION THREE:

- (a) Find the fourth roots of $3 - j4$ (6 marks)
- (b) With aid of a diagram express
(i) $3 + j4$ in polar form (4 marks)
(ii) $(2 - j3)(4 + j3)$ in the form $r \angle \theta$ (4 marks)
- (c) (i) Simplify $\frac{2 - j3}{1 + j2}$ (4 marks)
(ii) Determine $(3 + j4)(2 - j5)$ (2 marks)

QUESTION FOUR:

- (a) (i) Find from first principles $f'(x)$ when $f(x) = 3x$ (4 marks)
- (b) (i) Obtain the differential coefficient of $x^2 + 2xy - 2y^2 + x = 2$ (3 marks)
(ii) Find the equations of the tangent and normal to the curve
At the point $(2, 5)$, $y = x^3 - 2x^2 - 3x - 1$ (6 marks)
- (c) Differentiate the following
- (i) $(3x + 2)^4$ (3 marks)
- (ii) $\frac{2}{x^3}$ (2 marks)
- (iii) $\tan(2x + 1)$ (2 marks)

QUESTION FIVE:

- (a) Express the following in partial fractions
- (i) $\frac{10x + 37}{x^2 + 3x - 28}$ (4 marks)
- (ii) $\frac{42x + 44}{(6x + 5)^2}$ (6 marks)
- (b) Find the greatest or least value of y on the curve $y = 4x - x$ (4 marks)
- (c) Find the turning values of y on the graph $y = f(x)$ where
 $f(x) = 5 + 24x - 9x^2 - 2x^3$ (6 marks)