



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF MATHS & PHYSICS

UNIVERSITY EXAMINATION FOR:

CERTIFICATE IN ELECTRICAL & ELECTRONIC ENGINEERING

AMA1151 ENGINEERING MATHEMATICS 2

END OF SEMESTER EXAMINATION

SERIES: APRIL / MAY 2016 SERIES

TIME: 2HRS

DATE: APRIL / MAY 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID Mathematical table, calculator, no mobile phone

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

Do not write on the question paper.

QUESTION ONE

- a) Evaluate the following
- | | |
|---|--------|
| i) $\operatorname{Cosec} 17.92^{\circ}$ | (2Mks) |
| ii) $\operatorname{Sec} 49^{\circ}$ | (2mks) |
| iii) $\operatorname{Cot} 83^{016}$ | (2Mks) |
- b) Express $\frac{11x + 12}{(2x+3)(x+2)(x-3)}$
- (6Mks)
- c) Prove the following identities
- | | |
|---|--------|
| i) $1 + \tan^2 \theta = \sec^2 \theta$ | (3Mks) |
| ii) In triangle PQR, QR = 3.5, RP = 4 and PQ = 5. Calculate the size of angle P and hence find the area of the triangle | |
| | (5Mks) |
- d) Express (4, -3) in polar coordinates
- (4Mks)
- e) Differentiate from first principles $f(x) = x^2$ and find the value of the gradient of the curve at $x=3$
- (6Mks)

QUESTION TWO

- a) Solve the triangle ABC, given $\angle C = 67^\circ$ $a = 16.40\text{cm}$ and $b = 11.80\text{cm}$ (8Mks)
- b) Draw up a table of values from which you plot a graph of $y = \cos \theta$ and $y = \sin \theta$ (4Mks)
- c) (i) Prove that $\frac{\sin^3 \theta + \sin \theta \cos^2 \theta}{\cos \theta} = \tan \theta$ (4Mks)
- (ii) Solve for θ the equation
 $\sin^2 \theta - 1.707 \sin \theta \cos \theta + 0.707 \cos^2 \theta = 0$
Where $0 < \theta < 360^\circ$ (4Mks)

QUESTION THREE

- a) (i) Find the cube roots of 1 and show them on argand diagram (6Mks)
- b) (i) With aid of a diagram express
(i) $-5 + 4j$ in polar form (4mks)
(ii) $3 \angle 300^\circ$ in the form of $a + jb$ (4Mks)
- c) (i) Simply $\frac{4 - j5}{2 - j}$ (4mks)
- (ii) Determine $(3 - j2)(3 + j2)$ (2Mks)

QUESTIONS FOUR

- a) (i) Find from first principles $f'(x)$ when $f(x) = x$ (4mks)
- b) (i) Obtain the differential coefficient of $3x^4 - 2x^3 + x^2 - x + 10 = 0$ (2Mks)
- (ii) Find the equations of the tangent and normal to the curve $X^2 + y^2 - 3xy - 11 = 0$ at the point $x = 1, y = 2$ (6Mks)
- c) Differentiate the following
- (i) $X^3 \sin x$ (2Mks)
- (ii) $\frac{4e^x}{\sin^x}$ (2Mks)
- (iii) $\tan(4x + 1)$ (4Mks)

QUESTION FIVE

- a) Express the following in partial fractions
- (i) $\frac{1}{(x + 2)(x - 1)^2}$ (4Mks)
- (ii) $\frac{3x + 1}{(x - 1)(x^2 + 1)}$ (6Mks)

b) (i) Find the greatest or least value of the function $f(x) = x^2 + 4x + 3$ (4Mks)

(ii) 1000m of fencing is to be used to make a rectangular enclosure
find the greatest possible area and the corresponding dimensions. (6Mks)

