



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) Prove the following identities:-

(i) Given that $\sin(A+B) = \sin A \cos B + \cos A \sin B$ prove that
 $\sin 3A = 3\sin A - 4\sin^3 A$

(6Mks)

(ii) In triangle ABC, $A=4.73$ and $\angle C=42^\circ 12'$ calculate the size of angle A (6Mks)

b) Express in polar co-ordinates (-2, -3)

(5Mks)

c) Express $\frac{1}{(x+2)(x-1)^2}$ in partial fractions

(6Mks)

d) Simplify $\frac{1}{\sqrt{(x^2 - a^2)}}$ when $x = a \operatorname{cosec} \theta$

(7Mks)

QUESTION TWO

- a) A triangle ABC has $AB=19\text{cm}$, $AC=16\text{cm}$ and $\angle ABC = 50^\circ$. Find the remaining sides and angles. (8Mks)
- b) Find the values of θ between 0° and 360° that satisfy the equation $5 = 4\cos^2\theta + 4\sin\theta = 0$ (5Mks)
- c) (i) Prove that $\tan\theta + \cos\theta = \sec\theta\text{cosec}\theta$ (3Mks)
- (ii) In the right angled triangle ABC where $C=12$, $b=5$ and $a=13$ find $\sec B$ and $\text{cosec } C$ (5Mks)

QUESTION THREE

- a) Differentiate from first principle $f(x) = 3x^2 + 6x - 3$ (4Mks)
- b) Find the gradient of the curve $X = \frac{t}{1+t}$ $y = \frac{t^2}{1+t}$ at the point $(\frac{1}{2}, \frac{1}{2})$ (5Mks)
- c) Differentiate the following expressions
- (i) $Y = (x^2 - 3)(x + 1)$ and simplify the result (4Mks)
- (ii) $Y = 2^{x^2}$ (3Mks)
- (iii) $(3x + 2)^4$ (3Mks)

QUESTIONS FOUR

- a) If $\frac{(2-j)(3+j^2)}{3-j^4} = r(\cos\theta + j\sin\theta)$ (4 mks)
Find r
- b) (i) Rationalize $\frac{2-j^3}{1+j^2}$ (3mks)
- (ii) If $(2 + j^3)(3 - j^4) = x + jy$ find x and y (3Mks)
- c) Given $\cos 3\theta + j\sin 3\theta = (\cos\theta + j\sin\theta)^3$ by de Moivre's theorem; expand the expression and hence find $\tan 3\theta$ (4Mks)
- (ii) Find the fourth roots of $3 - j^4$ (6Mks)

QUESTION FIVE

- a) (i) Use the second derivative test to investigate the stationing values of the function xe^{-x} (5Mks)
- (ii) In alternating voltage is given by $\mu = 20\sin 50t$ volts, where t is the time in seconds. Calculate the rate of change of voltage when $t = 0.01\text{s}$ (3Mks)

b) (i) Investigate the stationary values of the function $f(x) = x^3 - 3x^2 + 3x$ and sketch the graphs of $y = f(x)$ (5Mks)

(ii) Express $\frac{7x^2 - 18x - 7}{(x - 4)(2x^2 - 6x + 3)}$ in partial functions. (7Mks)