



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF MATHS & PHYSICS

UNIVERSITY EXAMINATION FOR:

CERTIFICATE IN ELECTRICAL & ELECTRONIC ENGINEERING

AMA1250 ENGINEERING MATHEMATICS 3

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) (i) if $f(x) = 4x^3 - 2x^2 - 3x + 1$ Find $\frac{f(1+b) - f(1)}{b}$ (3Mks)
- ii) If $fx = 3x^2 + 2x - 9$ find $\frac{f(3+a) - f(3)}{9}$ (3Mks)
- b) (i) Find x from the equation $9 \cos x + 23 \sinh x + 54 = 0$ (4Mks)
- ii) If $\sin hx = 2$, what is thx (3Mks)
- c) Integrate
- i) $I = \frac{7x dx}{8x^2 + 4}$ by putting $Z = \sqrt{8x^2 + 4}$ (4Mks)
- ii) $I = \int x(3-2x)^4 dx$ (3Mks)
- d) Determine the following
- (i) $\int 3y^{1.3} dy$ (2Mks)
- (ii) $\int_2^3 (p-1)^2 dp$ (3Mks)

- (iii) Sketch the curve and find the area between the curve $y=x^2-x+2$, the ordinates $x=-1$ and $x=2$ and the x-axis (5mks)

QUESTION TWO

- a) (i) Given that $f(x)=x^2$, express as simple as possible $\frac{f(5+h)-f(5)}{h}$ h 0 (3Mks)
- (ii) Given that $f(x) = x^3$ find $\frac{f(a+h)-f(a-h)}{2h}$ (h o) (3Mks)
- b) Given that $f:x \rightarrow (10+x)$, $G:x \rightarrow x^3$ and $H:x \rightarrow x/2$ write down the functions
- a) FG (2Mks)
 b) GF (2Mks)
 c) FGH (3mks)
- c) Sketch the graph of $y = \frac{1+2}{x-3} + 2(x-3)$ (3Mks)
- d) The domain of the function $g(d) = 5x+1$ is $\{0, 1, 3, 4, 5\}$ find its range (4Mks)

QUESTION THREE

- a) Use Simpsons rule to find an approximation for the area under the curve $Y=1/x$ between $x=1$ and $x=2$ (use five ordinates) (12Mks)
- b) (i) Find the area bounded by the curve $y=3x^2+14x+15$, the x-axis and ordinates at $x = -1$ and $x=2$ (3Mks)
- (ii) Given that volume of solid of revolution is given $\int_a^b \pi y^2 dx$ The parametric equations of curve are $x=3t^2$, $y=3t - t^2$. Find the volume generated when the plane figure bounded by the curve, the x-axis and the ordinates corresponding to $t=0$ and $t=2$ rotates about the x-axis (hint:-remember to change the variable of the integral) (5Mks).

QUESTION FOUR

- a) (i) Find all first and second partial derivations of $Z = \sin xy$ (5Mks)
- (ii) If $z = \ln(e^x + e^y)$, show that $\frac{dz}{dx} + \frac{dz}{dy} = 1$ (6Mks)
 (partial d)
- b) (i) Use the trapezium rule to estimate the area under the curve $y=1/x$ from $x = 1$ to $x = 2$ using six ordinates (6Mks)
- (ii) Compare the results of b(i) above with the true area obtained by integration (3Mks)

QUESTION FIVE

- a) Integrate each of the following as per method indicated
- (i) $\int x^2 \ln x dx$ by parts (3Mks)
- (ii) $I = \int \frac{x+1}{x^2 - 3x+2} dx$ by partial functions (5Mks)

(iii) $I = \int \cos^3 x \, dx$ by trigonometric formation (3Mks)

b) Evaluate the following

(i) $I = \int_1^2 \int_0^\pi (3 + \sin \theta) \, d\theta \, dr$ (4Mks)

(ii) $I = \int_1^2 \int_0^3 (p^2 + q^2 - r^2) \, dp \, dq \, dr$ (5Mks)