



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

**UNIVERSITY EXAMINATION FOR:**

**DIPLOMA IN MEDICAL ENGINEERING**

**AMA2351: ENGINEERING MATHEMATICS VI**

**END OF SEMESTER EXAMINATION**

**SERIES: APRIL 2016**

**TIME: 2 HOURS**

**DATE: 9 May 2016**

## Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

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

**Do not write on the question paper.**

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## Question ONE

- (a) Show that the equation  $x^4 + x^2 = 80$  has a root between 2 and 3 hence taking an appropriate approximation determine the root correct to two decimal places. **(10 marks)**
- (b) Determine the Maclaurin series for the following:
- (i)  $\ln(1+x)$
- (ii)  $\ln(1-x)$
- (10 marks)**
- (c) Use Newton-Raphson formula to determine  $\sqrt[4]{9}$  correct to six decimal places. **(10 marks)**

## Question TWO

(a) Using Maclaurin series, determine the power series for the function  $f(x) = \frac{2+x}{(2-x)^4}$  as far as term in degree three hence evaluate  $\int_0^1 \frac{(x+3)(2+x)}{(2-x)^4} dx$ . **(10 marks)**

(b) Given that  $f(2.3145) = 0.004545$ ,  $f(2.3146) = 0.004544$  use linear interpolation and extrapolation to determine  $f(2.31445)$  and  $f(2.314655)$ . **(10 marks)**

### Question THREE

Use Newton-Raphson formula to show a better approximation for the equation  $x^3 + 5x^2 - 10x - 20 = 0$  hence determine the root correct to five decimal places taking  $x_0 = -1.5$ . **(10 marks)**

(b) Using Taylor theorem:

(i) Expand  $\sin\left(\frac{x}{6} + h\right)$  in ascending powers of h upto the term in degree four.

(ii) Approximate  $\sin 29.5^\circ$ . **(10 marks)**

### Question FOUR

(a) Use Taylor approximation to express  $\tan\left(\frac{x}{6} + h\right)$  as a polynomial in h as far as  $h^3$  hence estimate  $\tan 34^\circ$  correct to five decimal places. **(10 marks)**

(b) Determine the Maclaurin series for  $f(x) = \frac{5+x}{(5-x)^3}$  as far as the term in degree three hence evaluate  $\int_0^1 (x-7)f(x)dx$ . **(10 marks)**

### Question FIVE

(a) The table below shows values for a function  $f(x)$ . Use Newton-Gregory interpolation to evaluate.

(i)  $f(4.5)$

(ii)  $f(6.4)$

x	4	5	6	7	8	9	10
f(x)	-10	12	56	128	234	380	572

**(10 marks)**

(b) Use Maclaurin series to:

(i) Prove Binomial expansion

(ii) Determine series for  $y = \tan^{-1} x$

**(10 marks)**