



TECHNICAL UNIVERSITY OF MOMBASA

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.

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)