TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING (HDBC 12S)

AMA 3251: ENGINEERING MATHEMATICS IV

END OF SEMESTER EXAMINATION
SERIES: APRIL 2014
TIME ALLOWED: 2 HOURS

<u>**Instructions to Candidates:**</u>
You should have the following for this examination
-    *Answer Booklet*
This paper consist of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **TWO** printed pages
Question One (Compulsory)

$$f(x) = \sin x$$

a) Find the Maclaurin's series for **(8 marks)**

$$f(x) = \ln x$$

b) Using the Taylor's series find the value for about x = 2. **(8 marks)**

c) Solve the following simultaneous equations using Cramer's rule. **(7 marks)**
$$x + y + z = 4$$
$$2x - 3y + 4z = 33$$
$$3x - 2y - 2z = 2$$

d) Find the Fourier series to represent:
$$f(x) = \begin{cases} x + \pi & 0 \le x \le \pi \\ -x - \pi & -\pi \le x \le 0 \end{cases} \text{ for }$$

(7 marks)

Question Two

$$f(x) = \ln(1 + x)$$

a) Get a Maclaurin's series for and use it to approximate the value of ln 1.5 to the 5th term. **(10 marks)**

$$e^{\frac{x}{2}}$$

b) Expand as far as the term in x⁴. **(10 marks)**

Question Three

$$\begin{pmatrix} 1 & 5 & -2 \\ 3 & -1 & 4 \\ -3 & 6 & -7 \end{pmatrix}$$

a) Find the inverse of **(12 marks)**

$$\begin{pmatrix} 1 & 4 & -3 \\ -5 & 2 & 6 \\ -1 & -4 & 2 \end{pmatrix}$$

b) Evaluate the determinant of **(8 marks)**

Question Four

$$f(x) = e^{9x} \quad for \ 0 < x < \pi$$

a) Find the Fourier sine series for the function **(12 marks)**

$$\begin{pmatrix} j2 & (1+j) & 3 \\ (1-j) & 1 & j \\ 0 & j4 & 5 \end{pmatrix}$$

b) Determine the determinant of **(8 marks)**

Question Five

$$f(x) = x^3 - 10x^2 + 6$$

a) Find the Taylor's series for $\qquad$ about x = 3. **(12 marks)**

b) Represent the following function by a Fourier sine series:

$$f(t) = \begin{cases} t, & 0 \le t \le \dfrac{\pi}{2} \\ \dfrac{\pi}{2}, & \dfrac{\pi}{2} \le t \le \pi \end{cases}$$

(8 marks)