TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

DIPLOMA IN ELECTRICAL POWER ENGINEERING (DEPE)
DIPLOMA IN INSTRUMENTATION & CONTROL ENGINEERING (DICE)
DIPLOMA IN TELECOMMUNICATION & INFORMATION ENGINEERING (DTIE)

AMA 2350: ENGINEERIGN MATHEMATICS V

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

Instructions to Candidates:

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 **THREE** printed pages

Question One (Compulsory)

a) Given that $f(x) = xy^2 + jx^2y$ find the point where the Cauchy-Reimann equations are satisfied. **(5 marks)**

b) Determine if $Z = 2xy + j(x^2 - y^2)$ is analytic. **(6 marks)**

c) Find the Fourier series of the function:

$$F(x) = \begin{cases} x + \pi & 0 \le x \le \pi \\ -x - \pi & -\pi \le x \le 0 \end{cases}$$

(8 marks)

d) Determine half-Fourier sine series of the function $f(x) = \begin{cases} x & 0 \le x \le \pi/2 \\ \frac{\pi}{2} & \pi/2 < x < \pi \end{cases}$ **(7 marks)**

Question Two

a) Given that $f(z) = j - \frac{1}{\pi} \ln Z$, express f(z) in terms of U and V hence show that U and V are harmonic functions. **(10 marks)**

b) The $|z| = 4$ is described in the z-plane in the anticlockwise manner. Determine its image in the w-plane under the transformation $W = \frac{z+1}{z-2}$ and state the direction of development. **(10 marks)**

c) h of 1500 6 month bottles have an average contents of 753ml and the standard deviation of the

Question Three

a) Consider a function f(x) defined in the interval $- \le x \le 1$

(I) State the necessary and sufficient condition that the function is:

(i) ODD
(ii) EVEN

(II) State the harmonic series representing the function of it is:

(i) ODD
(ii) EVEN **(3 marks)**

b) Expand the function $f(x) = \frac{\pi - x}{2}(0, 2\pi)$ into Fourier series hence determine the series for $\frac{\pi}{4}$ **(4 marks)**

Question Four

a) Apply Newton-Raphson method taking Xo = 2 to find correct to five d.p the root of the equation $e^{-x} - 2\cos x - 1 = 0$

(8 marks)

x	-0.6	-0.4	-0.2	0	0.2	0.4	0.6	0.8	1
f(x)	-0.3888	-0.0512	-0.0016	0	0.0016	0.0512	0.3888	1.6384	5

Use Newton-Gregory formula for interpolation to determine:

(i) f(-0.36)

(ii) f(0.75) **(12 marks)**

Question Five

$$f(x) = \begin{cases} x & 0 \le x \le \pi/2 \\ \pi - 2 & \pi/2 < x < \pi \end{cases}$$

a) Determine half-range Fourier series for the function **(9 marks)**

b) Show that the function $U = \sin x \cosh y + 2\cosh x shy + x^2 + 4xy$ satisfies the Laplace equation. **(5 marks)**

c) Show that the root $ex = -\frac{1}{2}x - 1$ can be approximated as $x_{n+1} = \dfrac{x_n e^{xn} - e^{xn} - 1}{e^{xn} + \frac{1}{2}}$ **(6 marks)**