# TECHNICAL UNIVERSITY OF MOMBASA Faculty of Applied \& Health 

## Sciences

DEPARTMENT OF MATHEMATICS \& PHYSISCS<br>DIPLOMA IN BUILDING \& CIVIL ENGINEERING (DBCE 13J) DIPLOMA IN MEDICAL ENGINEERING (DME)

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) Solve the differential equation:

$$
\left(y^{2}+2\right) \frac{d y}{d x}=5 y \quad y=1 \quad x=\frac{1}{2}
$$

$$
x \frac{d y}{d x}=\frac{x^{2}+y^{2}}{y}
$$

b) Find the particular solution of the equation , given that $\mathrm{x}=1$ and $\mathrm{y}=4$
(10 marks)
c) Determine the Laplace transforms:

$$
\left\{s e^{2 t}-3 e^{-t}\right\}
$$

$2 \pi$
d) Determine the Fourier series for the periodic function of period defined by

$$
f t=\left\{\begin{array}{ccc}
0, & \text { when } & -1 \leq t \leq 0 \\
1 & \text { when } & 0 \leq t \leq \frac{\pi}{2} \\
-1 & \text { when } & \frac{\pi}{2} \leq t \leq \pi
\end{array}\right.
$$

(7 marks)

## Question Two

$$
2 e^{t}(\cos 3 t-3 \sin 3 t)
$$

a) Determine the Laplace transform of

$$
L\left\{3 e^{-1 / 2^{x}} \sin ^{2} x\right\}
$$

b) Find the Laplace transform of

## Question Three

a) Solve the differential equation:

$$
2 y(1-x)+x(1+y) \frac{d y}{d x}=0
$$

$$
\begin{equation*}
\text { give } x=1 \text { when } y=1 \tag{12marks}
\end{equation*}
$$

b) Determine the equation of the curve which satisfies the equation:

$$
x y \frac{d y}{d x}=x^{2}-1
$$

and which passes through the point $(1,2)$
(8 marks)

## Question Four

a) Determine the Fourier series for the periodic function defined by:

$$
f_{x}=\left(\begin{array}{ccc}
-2 & \text { when } & -\pi<x<\frac{\pi}{2} \\
5 & \text { when } & \frac{-\pi}{2}<x<\frac{\pi}{2} \\
-2 & \text { when } & \frac{\pi}{2}<x<\pi
\end{array}\right)^{\text {and has a period of } 2} \pi
$$

b) Find the half-range Fourier sine series to represent the function $f(x)=3 x \quad$ in the range $0 \leq x \leq \pi$

## Question Five

a) Find the particular solution of the differential equation:

$$
\begin{align*}
& \qquad\left(\frac{2 y-x}{y+2 x}\right) \frac{d y}{d x}=1 \\
& \qquad \frac{d y}{d x}=x(1-2 y)  \tag{14marks}\\
& \text { b) Solven that } \mathrm{y}=3 \text { when } \mathrm{x}=2 \\
& \qquad \text { the differential equation }
\end{align*}
$$

b) Solve the differ

