



# **THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE**

(A CONSTITUENT COLLEGE OF JKUAT)

## ***Faculty of Technology***

### **DEPARTMENT OF BUILDING AND CIVIL ENGINEERING**

DIPLOMA IN ARCHITECTURE

DIPLOMA IN CIVIL ENGINEERING

### **AMA 2207: ORDINARY DIFFERENTIAL EQUATIONS (ODE)**

SPECIAL/SUPPLEMENTARY EXAMINATION

**SERIES:** OCTOBER 2011

**TIME:** 2 HOURS

#### **INSTRUCTIONS:**

You should have the following for this examination

- *Answer booklet*
- *Mathematical tables/Calculator*

This paper consists of **FIVE** Questions.

Answer **QUESTION ONE** 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) Determine Laplace transform of the following

(i)  $L$

(ii)  $L$

(iii)  $L$

(iv)  $L$

(10 marks)

$$2 \frac{d^2y}{dx^2} - 5 \frac{dy}{dx} - 3y = 4 \sin 2x$$

(b) Solve;

(20 marks)

### QUESTION TWO

(a) Using laplace transform, solve the equation  $(D^2 + 2D + 2)y + = e^{-t}$   
(Assume zero initial conditions).

(10 marks)

(b) Find the inverse laplace transform of the following;

$$F(s) = \frac{6}{s} - \frac{1}{s-8} + \frac{4}{s-3}$$

(i)

$$H(s) = \frac{19}{s+2} - \frac{1}{3s} + \frac{7}{s^5}$$

(ii)

(10 marks)

### QUESTION THREE

(a) Solve the differential equation:

$$(x^2 + xy) \frac{dy}{dx} = xy - y^2$$

, given that  $x=1$  when  $y=1$

(9 marks)

$$\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6x = 0$$

- (b) Solve, (11 marks)

**QUESTION FOUR**

- (a) Solve the following Bessel's equation,

$$x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + (x^2 - n^2)y = 0$$

(20 marks)

**QUESTION FIVE**

$$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} = 6$$

- (a) Solve, (8 marks)

- (b) Using Laplace transform, solve the following simultaneous differential equations.

$$(D^2 + 4)x - 2Dy = 2$$

$$Dx + (D^2 + 4)y = 0$$

Given that  $x = 1, y = Dx = Dy = 0, \text{ at } t = 0$  (12 marks)