



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

**DIPLOMA IN ARCHITECTURE
DIPLOMA IN CIVIL ENGINEERING
DIPLOMA IN BUILDING & CIVIL ENGINEERING**

AMA 2207: ORDINARY DIFFERENTIAL EQUATIONS

END OF SEMESTER EXAMINATION

SERIES: AUGUST/SEPTEMBER 2011

TIME: 2 HOURS

Instructions to Candidates:

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

SECTION A (COMPULSORY)

Question 1

a) Determine Laplace transform of the following

(i) $L\{\cos at\}$

(ii) $L\{t\}$

(2 marks)

b) Solve the differential equation:

$$y'' + 6y' + 25y = 8e^{-7x}$$

(12 marks)

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

c) (i) Solve,

(8 marks)

$$(3x^2y - 1)dx + (x + 6y - y^2)dy = 0$$

(ii) Solve the following.

(8 marks)

SECTION B (Answer any TWO questions from this section)

Question 2

$$(D^2 + 2D + 2)y = e^{-t}$$

a) Using Laplace transform, solve the equation

(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)

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

(ii)

(10 marks)

Question 3

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

a) Solve,

(20 marks)

Question 4

Solve the following Bessel's equation

(20 marks)

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

Question 5

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

a) Solve

(8 marks)

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

$$\begin{aligned}(D^2 + 4)x - 2Dy &= 2 \\ Dx + (D^2 + 4)y &= 0\end{aligned}$$

Given that $x = 1, y = Dx = Dy = 0$, at $t = 0$

(12 marks)