



THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

(A Constituent College of Jkuat)

Faculty of Engineering and Technology

DEPARTMENT OF BUILDING AND CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING

AMA 3204: 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 **TWO** printed pages

SECTION A (COMPULSORY)

Question 1

- a) Use Laplace transform to solve the equation , $(D^2 - 5D + 6)y = 3$, given $y = 2, D_y = 1$ at $t = 0$ (15 marks)

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

- b) Solve (15 marks)

SECTION B (Answer any TWO questions from this section)

Question 2

- 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)

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

(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

- $$x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + (x^2 - n^2)y = 0$$
- a) Solve the following Bessel's equation: (20 marks)

Question 5

- $$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} = 6$$
- a) Solve, (8 marks)
- b) Using Laplace transform, solve the following simultaneous differential equations;

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

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

$$x = 1, y = D_x = D_y = 0, \text{ at } t = 0$$

Given that

(12 marks)