



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

AMA2251: ENGINEERING MATHEMATICS IV

END OF SEMESTER EXAMINATION

SERIES: APRIL 2016

TIME: 2 HOURS

DATE: 9 May 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

a) The current flowing in an electric circuit is given by the $Ri + L \frac{di}{dt} = E$ where R, L and E are constants. Using Laplace transform, solve for current given $t = i = 0$ (10 marks)

b) Solve the following differential equations

i. $2y(1 - x) = -(x + xy) \frac{dy}{dx}$

ii. $\frac{dy}{dx} = \frac{3}{x} - \frac{x}{y}$ (10 marks)

c) Solve $\frac{d^2y}{dx^2} - 3 \frac{dy}{dx} - 4y = 3 \sin x$ given that $x = y = y' = 0$ (10 marks)

Question TWO

a) Determine the inverse Laplace transform of the following

i. $\frac{3s^2 + 16s + 15}{(s+3)^3}$

ii. $\frac{3 + 6s + 4s^2 - 2s^3}{s^2(s^2 + 3)}$ (10 marks)

b) Solve the following simultaneous equations using Laplace transform taking $t = x = y = 0$

$$\frac{dy}{dt} + x = 1$$

$$\frac{dx}{dt} - y + 4e^t = 0 \quad (10 \text{ marks})$$

Question THREE

a) An inductor of 2H and a resistor of 200Ω are connected in series to an emf of $100 \sin 150t$. Determine the current in the circuit at any given time taking $t = i = 0$ (10 marks)

b) Solve the following equation using Laplace transform $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 3e^x \cos 2x$ taking $y(0) = 2$ (10 marks)

Question FOUR

Solve

a) $\frac{x+y}{y-x} = \frac{dy}{dx}$

b) $(y^2 + 2)\frac{dy}{dx} = 5y$

c) $\frac{dy}{dx} + x = 2y$

d) $(y^2 e^{xy^2} + 4x^3)dx + (2xye^{xy^2} - 3y^2)dy = 0$ (10 marks)

Question FIVE

a) Solve $5\frac{d^2y}{dx^2} + 9\frac{dy}{dx} - 2y = 3e^x$ (10 marks)

b) Use Laplace transforms to solve $\frac{d^2x}{dt^2} + 6\frac{dx}{dt} + 8x = 0$ taking $x(0) = 4$ and $x'(0) = 8$ (10 marks)