



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2018/2019 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATION FOR, BACHELOR OF TECHNOLOGY IN ELECTRICAL AND ELECTRONICS ENGINEERING

AMM 211 – ENGINEERING MATHEMATICS 1V

DURATION: 2 HOURS

DATE: 23/04/2019

TIME: 2-4 PM

Instructions to candidates:

1. Answer question One and Any Other Two questions
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

a) Compute Laplace transform of $F(t) = 1$ 3mks

b) Find the general solution to the following differential equation 4mks

$$y'' - 6y' - 2y = 0$$

c) Find the inverse transform of

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

d) Solve the following IVP

$$\frac{dV}{dt} = 9.8 - 0.196V \quad V(0) = 48 \quad \text{4mks}$$

e) Find the Fourier sine series for $f(x) = x$ on $-L \leq X \leq L$ 6mks

f) Find the Fourier cosine series for $f(x) = x^3$ on $0 \leq X \leq L$ 5mks

g) Solve the following heat problem for the given initial conditions

$$\frac{\partial y}{\partial t} = K \frac{\partial^2 u}{\partial x^2}$$
$$u(x, 0) = f(x) \quad u(0, t) = 0 \quad u(1, t) = 0$$
$$f(x) = 6 \sin\left(\frac{\pi x}{L}\right) \quad \text{4mks}$$

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a) Find the Fourier series for $f(x) = x$ on $-L \leq x \leq L$ 7mks

b) Find the sine series for $f(x) = 1 + x^2$ on $0 \leq x \leq L$ 8mks

c) Find the Laplace transforms of the given functions

$$h(t) = 3 \sinh(2t) + 3 \sin(2t) \quad \text{5mks}$$

QUESTION THREE (20 MARKS)

a) Find the Laplace transforms of the given functions

$$g(t) = e^3 + \cos(6t) - e^{3t} \cos(6t) \quad \text{6mks}$$

b) Solve the following IVP

$$y'' + 11y' + 24y = 0, \quad y(0) = 0, \quad y'(0) = -7 \quad 7\text{mks}$$

c) Find the Fourier cosine series for

$$f(x) = \begin{cases} \frac{L}{2}, & 0 \leq x \leq \frac{L}{2} \\ x - \frac{L}{2}, & \frac{L}{2} \leq x \leq L \end{cases} \quad \text{on } 0 \leq x \leq L \quad 7\text{mks}$$

QUESTION FOUR (20 MARKS)

a) Solve the following IVP 8mks

$$y'' + 4y' + 4y = 0, \quad y(0) = 12, \quad y'(0) = -3$$

b) Find the Fourier cosine series for 7mks

$$F(x) = L - x \text{ on } 0 \leq x \leq L$$

c) Find the inverse transformation of the following 5mks

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