



(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**SECOND YEAR SECOND SEMESTER SUPP/SPECIAL
EXAMINATIONS**

**FOR DIPLOMA
IN
ELECTRICAL AND ELECTRONICS ENGINEERING**

COURSE CODE: DEE 071

COURSE TITLE: ENGINEERING MATHEMATICS IV

DATE: Wednesday 3rd Aug, 2022

TIME: 8.00am - 10.00am

INSTRUCTIONS TO CANDIDATES

Question ONE (1) is compulsory
Answer Any Other TWO (2) questions

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.



Question One

a) Find the Laplace transform for:

i $f(t) = 3,$

ii $f(t) = e^{-5t}$

iii $\sin 2t + e^{3t}$

iv $3e^{-2t} + t$

v $te^{-t} \sin 2t$ (15 marks)

b) Prove that $L\{f'(x)\} = sF(s) - f(0)$ (5 marks)

c) Obtain the Fourier series for the periodic function defined by

$$f(x) = \begin{cases} -k, & -\pi < x < 0 \\ k, & 0 < x < \pi \end{cases}$$

(10 marks)

Question two

a) Fourier series can be expressed in the form:

$$f(x) = \frac{1}{2}a_0 + \sum_{n=1}^{\infty} \{a_n \cos nx + b_n \sin nx\}, \text{ derive expressions for}$$

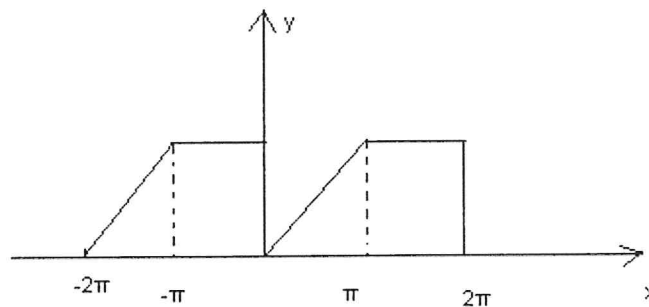
i a_0

ii a_n

iii b_n

(6 marks)

b) Determine the Fourier series for the function shown



(8 marks)

c) Using the 2nd derivative formula for Laplace transform find Laplace transform for

$$f(t) = \sin kt$$

(6 marks)

Question three

a) Perform Laplace transform and find solution to the following differential equations

i $f'(t) + f(t) = 4$, where $f(0) = 0$

ii $f'(t) - f(xt) = e^{-2t}$, where $f(0) = 0$

iii $3f'(t) - 2f(t) = 4e^{-t} + 2$, where $f(0) = 0$

iv $f'(t) + f(t) = 5$, where $f(0) = -1$

(14 marks)

- b) i Using $L\{f''(x)\} = s^2F(s) - sf(0) - f'(0)$ find the Laplace transform of $f(t) = \cos t$
(6 marks)

Question four

- a) Find the inverse Laplace transform of the function given by

$$F(s) = \frac{2 - 5s}{(s - 6)(s^2 + 11)}$$

- b) Determine the Fourier Series to represent the function $f(x) = 2x$ in the range $-\pi$ to π
(10 marks)

Question five

- a) Find the inverse Laplace transforms of the following functions

i) $\frac{e^{-s}(1+s)}{2(s^2+1)}$

(3 marks)

ii) $\frac{s}{s^2 - 2s + 2}$

(3 marks)

iii) $\frac{5s+1}{s^2 - s - 12}$

(4 marks)

- b) Prove that $L\{tf(t)\} = -F'(s)$

(4 marks)

- c) Hence find Laplace transform for :

i) $t \sin 2t$

ii) te^{-4t}

(6 marks)