TECHNICAL UNIVERSITY OF MOMBASA

School of Engineering and Technology

DEPARTMENT OF MEDICAL ENGINEERING

DIPLOMA IN MEDICAL ENGINEERING

DIPLOMA IN TECHNOLOGY IN MEDICAL ENGINEERING

DIPLOMA IN REFRIGERATION & AIR CONDITIONING

DME/SEP2021/J + S-FT

DTME/SEP2021/J + S-FT

DRAC/SEP2021/J + S-FT

AMA 2151

ENGINEERING MATHEMATICS II

END SEMESTER EXAMINATION
SERIES: APRIL 2022
TIME: 2 HOURS

INSTRUCTIONS
You should have the following for this examination

- Answer booklet
- Scientific calculator
- SMP Advanced tables
- Examination pass
- Student ID

This paper consists of ***FIVE*** questions
Answer Question **ONE (compulsory)** and any other **TWO** questions

Question1

(a) i) Differentiate from first principle $f(x) = x^2$ and determine the value of the gradient of the curve at $x = 2$.

ii) Determine the differential coefficient of $y = 3x^2 \sin 2x$.

(10 marks)

(b) Given $z = 4x^2y^3 - 2x^3 + 7y^2$ determine

i) $\dfrac{\partial^2 z}{\partial x^2}$

ii) $\dfrac{\partial^2 z}{\partial y^2}$

iii) $\dfrac{\partial^2 z}{\partial x \partial y}$

iv) $\dfrac{\partial^2 z}{\partial y \partial x}$

(10 marks)

Question2

(a) The parametric equations of a cycloid are $x = 4(\theta - \sin\theta)$ and $y = 4(1 - \cos\theta)$. Determine

i) $\dfrac{dy}{dx}$

ii) $\dfrac{d^2y}{dx^2}$

(10 marks)

(b) The distance x metres moved by a car in a time t seconds is given by $x = 3t^3 - 2t^2 + 4t - 1$. Determine the velocity and acceleration when

i) $t = 0$

ii) $t = 1.5s$

(10 marks)

Question3

(a) The height of a right circular cone is increasing at $3mm/s$ and its radius is decreasing at $2mm/s$. Determine the rate at which the volume is changing in cm^3/s when the height is $3.2cm$ and the radius is $1.5cm$.

(10 marks)

(b) Determine derivative for the following

i) $y = x^3 \cos 3x \ln 3x$

ii) $y = \dfrac{4 \sin 5x}{5x^4}$

(10 marks)

Question4

(a) determine $\int e^{ax} \cos bx dx$

(10 marks)

(b) Determine $\int \sqrt{a^2 - x^2} dx$

(10 marks)

Question5

(a) Given that $z = 2x^3 \sin 2y$ determine the rate of change of z when x is 2 units and y is $\pi/6$ radians and when x is increasing at 4 units/s and y is decreasing at 0.5 units/s.

(10 marks)

(b) Determine $\int \dfrac{dx}{\cos x}$

(10 marks)