INTERNATIONAL UNIVERSITY OF EAST AFRICA

'Learning to Succeed'

FACULTY OF ENGINEERING

END OF SEMESTER EXAMINATIONS - A

PROGRAMME: DIPLOMA IN ELECTRICAL AND CONTROL ENGINEERING

YEAR/SEM: YEAR 1/SEMESTER 2

COURSE CODE: DEE1206 (DEE)

NAME: ENGINEERING MATHEMATICS II- DIPLOMA ELECTRICAL

DATE: 2025-04-24

TIME: 2:00-5:00PM

INSTRUCTIONS TO CANDIDATES:

1. Read the instructions very carefully
2. The time allowed for this examination is STRICTLY three hours
3. Read each question carefully before you attempt and allocate your time equally between all the Sections
4. Write clearly and legibly. Illegible handwriting cannot be marked
5. Number the questions you have attempted
6. Use of appropriate workplace examples to illustrate your answers will earn you bonus marks
7. Any examination malpractice detected will lead to automatic disqualification.

DO NOT WRITE ANYTHING ON THE QUESTION PAPER

Section A Attempt any 2 questions in Section A

Question 1:

a. Determine the differential coefficient of $y = \sec 2x$ (15 Marks)
b. Find the derivative of: $y = \sec ax$ (10 Marks)

Question 2:

a. Find the differential coefficient of: $y = 3x^2 \sin 2x$ (07 Marks)
b. Find the rate of change of y with respect to x given: $y = 3\sqrt{x} \ln 2x$ (08 Marks)
c. Determine the rate of change of voltage, given $v = 5t \sin 2t$ volts, when t=0.2s (10 Marks)

Question 3:

Differentiate the following with respect to the variable:

a. $y = \frac{2}{5}x^3 - \frac{4}{x^3} + 4\sqrt{x^5} + 7$ (05 Marks)
b. $y = 3e^{2x}$ (05 Marks)
c. $y = \frac{4}{3e^{5t}}$ (05 Marks)
d. $y = 5t + \frac{4}{\sqrt{t^5}}$ (05 Marks)
e. $y = \frac{(x+2)^2}{x}$ (05 Marks)

Question 4:

Determine the differential coefficient of

a. $y = \sqrt{3x^2 + 4x - 1}$ (07 Marks)
b. $y = 3tan^4 3x$ (08 Marks)
c. $y = 3\cos(5x^2 + 2)$ (10 Marks)

Section B Attempt any 2 questions in Section B

Question 1:

a. Determine, using Pascal's triangle method, the expansion of $(2p - 5q)^5$ (10 Marks)
b. Use Pascal's triangle to expand $(x - y)^7$ (15 Marks)

Question 2:

a. Use the binomial theorem to expand $(a + 2x)^4$ (07 Marks)
b. Expand $(2x - 3y)^4$ (08 Marks)
c. Expand $\left(2x + \frac{2}{x}\right)^5$ (10 Marks)

Question 3:

a. Expand $(p + 2q)^{11}$ as far as the fifth term (10 Marks)
b. Determine the sixth term of $\left(3p + \frac{3}{q}\right)^{13}$ (5 Marks)
c. Use the binomial series to determine the expansion of $(2 + x)^7$ (10 Marks)

Question 4:

a. Find the angle between the following vectors $V_1 = 2i + 4j$ and $V_2 = i + 5j$ (05 Marks)
b. Find the angle between the following vectors $V_1 = 2i + 3j + K$ and $V_2 = 4i + j + 2K$ (10 Marks)
c. Find $V_1 \times V_2$ given $V_1 = 2i - 4j - K$ and $V_2 = 3i - j + 2K$ (10 Marks)