MACHAKOS UNIVERSITY

University Examinations for 2022/2023 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR FIRST SEMESTER EXAMINATIONS FOR

BACHELOR OF SCIENCE (ELECTRICAL AND ELECTRONICS ENGINEERING)

BACHELOR OF SCIENCE (CIVIL ENGINEERING)

BACHELOR OF SCIENCE (MECHANICAL ENGINEERING)

ECU 200: ENGINEERING MATHEMATICS V

DATE: **TIME:**

INSTRUCTIONS TO CANDIDATES.

Answer question ONE and any other TWO questions

QUESTION ONE (COMPULSORY) (30 MARKS)

a) Evaluate $\int_0^1 2e^{6x-1}\,dx$ (3 marks)

b) Integrate the following expressions

i. 2 sin (4x+9) (3 marks)

ii. 4 sec ^{2} (3t+1) (3 marks)

c) Use Simpson's rule with four intervals to evaluate (4 marks)

$$\int_1^3 \frac{2}{\sqrt{x}}\,dx$$

d) Use Mid-ordinate rule with 4 ordinates to evaluate (5 marks)

$$\int_0^{2.4} e^{\frac{-x^2}{2}}\,dx$$

e) Resolving into partial fractions, evaluate (5 marks)

$$\int \frac{2x^2-9x-35}{(x+1)(x-2)(x+3)}\,dx$$

f) Using standard substitutions determine

i. $\int \frac{5}{\sqrt{4-t^2}}\ dt$ (3 marks)

ii. $\int_{-3}^{4} \frac{3}{x^2-4}\ dx$ (4 marks)

Question 2

a) Evaluate

$\int_1^2 \int_0^3 x^2 y dx dy$ (3 marks)

b) Evaluate $\int_1^2 \int_0^3 \int_0^1 (p^2 + q^2 - r^2)\ dpdqdr$ (4 marks)

c) Evaluate $\int_1^2 \int_0^{\pi} (3 + sin\theta) d\theta dr$ (4 marks)

d) Use Binomial theorem to determine the expansion of

$(2p - 3q)^5$ (5 marks)

$(2 + x)^7$ (4 marks)

QUESTION THREE (20 MARKS)

a) Use the Maclaurins series to find the series for:

i. ln[1 + x] (4 marks)

ii. e^x (3 marks)

b) Find the first three terms of the series for $e^x \ln(1 + x)$ (3 marks)

c) Evaluate

i. $\int sin^5\theta\ d\theta$ (5 marks)

iii. $\int_{-2}^{1} \frac{3x^2+16x+15}{(x+3)^3}\ dx$ (5 marks)

QUESTION FOUR (20 MARKS)

a) Using L'Hospital's Rule Find the limit of

i. $\lim_{x\to 0}\left\{\frac{sin^2x}{x^2}\right\}$ (3 marks)

ii. Evaluate $x \overset{lim}{\longrightarrow} 0\left\{\frac{\sin hx-\sin x}{x^3}\right\}$ (4 marks)

iii. $\lim_{x\to 1}\{\frac{x^3+x^2-x-1}{x^2+2x-3}\}$ (3 marks)

b) Evaluate $\int_0^{\pi/4} 4cos^4\theta\ d\theta$ (5 marks)

QUESTION FIVE (20 MARKS)

a) Using trapezoidal rule with 8 intervals evaluate

$\int_{-2}^{1} 2\ ln\ 3x\ \ dx$ (7 marks)

b) Evaluate the following expression correct to three decimal places using Simpson's rule with 6 intervals (7 marks)

$$\int_0^{\pi/3}(1-\frac{1}{3}sin^2\theta)\ d\theta$$

c) Evaluate $\int x^2e^{3x}\ \ dx$ (6 marks)