(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2022/2023 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER

SPECIAL/ SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION AND BACHELOR OF SCIENCE

COURSE CODE: MAA213/MAT 221/MAA 123

COURSE TITLE: INTEGRAL CALCULUS/CALCULUS II

DATE: 8/8/2023 **TIME:** 11.00 AM -10.00 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE 30 MARKS

a) Evaluate $\int_0^1 x\sqrt{x+3}dx$ (5mks)

b) State the mean value theorem (2mks)

c) Evaluate the integral $\int cos^3 x dx$ (5mks)

d) Evaluate $\int \frac{3x+11}{x^2-x-6}dx$ (5mks)

e) Find the length of a curve $y=\sqrt{a^2-x^2}$ from $x=0$ to $x=\frac{a}{2}$ (5mks)

f) A curve $y=x^2-1$ is rotated about the x-axis through 360°, find the volume of the solid generated. (5mks)

g) State the fundamental theorem of calculus (2mks)

QUESTION TWO 20 MARKS

2 (a) Evaluate $\int \sin^5 x \cos^6 x dx$ (5mks)

(b) Evaluate $\int \frac{\sin^7 x}{\cos^4 x}dx$ (5mks)

(c) Show that $\int_0^\infty x^2 e^{-x}dx = 2$ (5mks)

(d) Evaluate $\int \sqrt{16-x^2}dx$ (5mks)

QUESTION THREE 20 MARKS

3. a) Determine the surface area of the solid obtained by rotating $y=\sqrt{9-x^2}$ about x-axis for $0 \le x \le 1$ (7mks)

b) Find the length of the arc of the curve $y=3x^{3/2}-1$ from x=0 to x=2 (7mks)

c) Find the volume generated by rotating about x-axis the area enclosed by the curve $y=x^2+1, y=0, x=0, x=2$. (6mks)

QUESTION FOUR 20 MARKS

4. a) Show that $\int_0^{\infty} \frac{2xdx}{1+x^4} = \frac{\pi}{2}$ (5mks)

b) Show that $\int_1^{\infty} e^{-x} \sin x dx = \frac{1}{2}$ (5mks)

c) Evaluate $\int_0^{\infty} e^{-x} dx$ (5mks)

d) Evaluate $\int x^2 \sin(x^3) dx$ (5mks)

QUESTION FIVE 20 MARKS

(a) Find $\int (4scosx + \frac{7x^4 - \sqrt{x}}{x})\, dx$ (3 mks)

(b) $\int \frac{5x^3 - 3x^2 + 2x - 1}{x^4 + x^2}\, dx$ (8 mks)

(c) A particle moves in a straight line such that its acceleration is given by $a(t) = 8t + 4$. Its initial velocity is $v(0) = -12\ cm/s$ and its initial displacement is $s(0) = 10\ cm$. Find the function of its position s(t) (9 mks)