(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2019/2020 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER

SUPPLEMENTARY/SPECIAL EXAMINATION

FOR THE DEGREE OFBACHELOR EDUCATION AND BACHELOR OF SCIENCE

COURSE CODE: MAA 123/MAT 221/MAA212/MAA213

COURSE TITLE: CALCULUS II/INTEGRAL CALCULUS

DATE: 10/02/2021   **TIME:** 11 AM – 1 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

QUESTION ONE COMPULSORY (30 MARKS)

a) Evaluate $\int \frac{3x-1}{(3x^2-2x+1)^4} dx$ (6 mks)

b) Find $g(x)$ if $g''(x) = \frac{10x^2+6x-3}{\sqrt{x}}$ where $\begin{cases} g'(1) = 1 \\ g(0) = 4 \end{cases}$ (6 mks)

c) Determine $\int \frac{d\theta}{6+5\sin\theta}$ (6 mks)

d) Find the value of $\int_0^1 \frac{3x^2}{x^3+7} dx$ (6 mks)

e) Work out $\int 3\cos^4(3t)\sin^2(3t) dt$ (6 mks)

QUESTION TWO (20 MARKS)

a) Evaluate $\int (3-2x)^3 dx$ (5 mks)

b) Find $\int t^4 e^{-3t} dt$ (5 mks)

c) Evaluate $\int_3^4 \frac{4x^2-2x+3}{(x^2+1)(x-2)} dx$ (5 mks)

d) Find $\int \sin^4 x dx$ (5 mks)

QUESTION THREE (20 MARKS)

a) Evaluate $\int_0^\pi 3x\sin x^2 dx$ (6 mks)

b) Find $\int \frac{d\theta}{\sin\theta}$ (4 mks)

c) Using appropriate trigonometric substitution evaluate $\int \sqrt{(a^2-x^2)} dx$ (5 mks)

d) Find $f(x)$ if $f''(x) = 6x^2 + 3x - 2$ with the conditions $f'(1) = 4$ and $f(2) = 1$ (5 mks)

QUESTION FOUR (20 MARKS)

a) Define the term improper integral (2 mks)

b) Evaluate the integral $\int_1^\infty \frac{3}{x^3} dx$ (3 mks)

c) Find the integral $\int \cos^2 x \sin^3 x dx$ (5 mks)

d) Let $f(x) = (2x-3)^2$, find the number C that certify the conditions of the Mean value theorem on the interval $(-3,0)$ (5 mks)

e) Find the area enclosed by the curve $y = 10x - x^2$ and the line $y = x^2$ (5 mks)

QUESTION FIVE (20 MARKS)

a) Determine

    (i) $\int_0^1 (x^3 + 4x^2 - 2)e^{-3x}\, dx$ (5 mks)

    (ii) $\int_0^\pi \frac{3}{2} x^2 \sin x\, dx$ (5 mks)

b) Evaluate $\int_0^1 \sin\frac{1}{2}\theta \sin\frac{3}{2}\theta\, d\theta$ (5 mks)

c) Find the length of the arc $x^2 = 4y^3$ between the points $(0,1)$ and $(3,5)$ (5 mks)