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(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2017/2018 ACADEMIC YEAR
SECOND YEAR FIRST SEMESTER
MAIN EXAMINATION

**FOR THE DEGREE OF BACHELOR OF EDUCATION AND
BACHELOR OF SCIENCE**

COURSE CODE: MAT 221

COURSE TITLE: CALCULUS II

DATE: 16/01/18

TIME: 9 AM -11 AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE COMPULSORY (30 MARKS)

- a) Find $\int x^2 \sin(4 - 2x^3) dx$ (4 mks)
- b) Evaluate $\int \frac{2x^3 - x^2 + 3x - 1}{\sqrt[3]{x}} dx$ (4 mks)
- c) Using $\sin\theta$ substitution
- (i) Find $\int \frac{1}{\sqrt{a^2 - x^2}} dx$ (4 mks)
- (ii) Hence evaluate $\int_1^2 \frac{1}{\sqrt{5 - x^2}} dx$ (3 mks)
- d) Evaluate $\int_0^5 \frac{3x - 6}{\sqrt{2x^2 - 8x + 9}} dx$ (4 mks)
- e) Find $\int \sin^4 x dx$ (5 mks)
- f) Show that the volume generated when the area bounded by x-axis, the curve $y = 2 - 3\sin 2x$ and the lines $x = 0$ and $x = \pi$ if the rotation is about x-axis is $9.5\pi^2$ (6 mks)

QUESTION TWO (20 MARKS)

- a) Find
- (i) $\int_0^2 \frac{2x - 3}{x + 2} dx$ (4 mks)
- (ii) $\int_1^3 2x^2 \ln 2x dx$ (4 mks)
- b) Evaluate
- (i) $\int \frac{6x^2 + 7x - 25}{(x - 3)(x^2 + x - 2)} dx$ (5 mks)
- (ii) $\int \frac{-(9x^2 + 4x + 4)}{x^2(x^2 - 4)} dx$ (7 mks)

QUESTION THREE (20 MARKS)

- a) Find $\int \frac{d\theta}{\cos\theta}$ (4 mks)
- b) Determine $\int \frac{d\theta}{6 + 5\sin\theta}$ (6 mks)
- c) Using appropriate trigonometric substitution evaluate $\int \sqrt{a^2 - x^2} dx$ (6 mks)
- d) Find the area enclosed by the curve $y = 10x - x^2$ and the line $y = x^2$ (4 mks)

QUESTION FOUR (20 MARKS)

- a) Determine
- (i) $\int_0^1 (2x^3 + 3x^2 - 4)e^{-2x} dx$ (5 mks)
 - (ii) $\int_0^{\frac{\pi}{2}} x^2 \sin x dx$ (5 mks)
- b) Evaluate $\int_0^1 \cos \frac{1}{2} \theta \cos \frac{3}{2} \theta d\theta$ (5 mks)
- c) Find the length of the arc $x^2 = 4y^3$ between the points (0,1) and (3,5) (5 mks)

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