



(Knowledge for Development)

KIBABII UNIVERSITY

MAIN EXAMINATION (SCHOOL BASED)

UNIVERSITY EXAMINATIONS

2015/2016 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE/ARTS

COURSE CODE: MAT 221

COURSE TITLE: CALCULUS II

DATE: 18/04/2016

TIME: 11.00 - 01.00 p.m

INSTRUCTIONS TO CANDIDATES

Answer Question One in and Any other TWO Questions

TIME: 2 Hours

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

QUESTION ONE COMPULSORY (30 MARKS)

(a) Evaluate the following integrals;

(i) $\int (4x^3 + 2x^2 - 3x) dx$ (2 mks)

(ii) $\int (8x - 7)^4 dx$ (3 mks)

(iii) $\int x^2 e^{2x} dx$ (3 mks)

(b) Compute

(i) $\int_1^2 \left(\frac{3x^3 - 5x^2}{x} \right) dx$ (3 mks)

(ii) $\int_2^4 \frac{x}{x^2 - 3} dx$ (4 mks)

(c) A car moves with acceleration $a(t) = 10 + 8t - 3t^2$. Its initial velocity is $v(0) = 30 \text{ m/s}$ and its initial displacement is $S(0) = 100 \text{ m}$. Find its position after t seconds (6 mks)

(d) Show that the area bounded by the curves $y = 3 - x^2$ and $y = x^2 - 5x$ is $14\frac{11}{24}$ square units (7 mks)

(e) Define the word improper integral (2 mks)

QUESTION TWO (20 MARKS)

(a) Evaluate the following integrals;

(i) $\int \sin 5x \sin 2x dx$ (3 mks)

(ii) $\int \cos 4x \sin 7x dx$ (3 mks)

(iii) $\int \tan(2x - 3) dx$ (3 mks)

(b) Compute

(i) $\int_0^{2\pi} t^3 \cos 2t dt$ (6 mks)

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

QUESTION THREE (20 MARKS)

(a) Determine the integral using partial fractions (7 mks)

$$\int \frac{6x^2 + 7x - 25}{(x - 1)(x - 2)(x + 3)} dx$$

(b) Find the function $f(x)$ whose tangent has slope $5x^2 + 1$ for each value of x and whose curve passes through $(-2, 4)$ (5 mks)

(c) Find the volume of revolution between the lines $x = 1$, $x = 4$ and $y = 3x^3$ If rotated about x-axis (6 mks)

(d) State the mean value theorem of integration (2 mks)

QUESTION FOUR (20 MARKS)

- (a) Evaluate $\int \frac{3t-1}{\sqrt{3t^2-2t-1}} dt$ (5 mks)
- (b) Compute $\int_1^2 t^3 \ln t dt$ (5 mks)
- (c) Find the integral $\int \frac{x-8}{x^2+x-2} dx$ (5 mks)
- (d) Evaluate $\int 3 \sin(4x - 2) dx$ (5 mks)

QUESTION FIVE (20 MARKS)

- (a) Find $f(x)$ if $f''(x) = 12x^2 + 7x - 5$ where $f(0) = 3$ and $f(1) = 1$ (5 mks)
- (b) Find the area between $f(x) = x^2 - 4x + 7$ and $g(x) = x^3 - 7x^2 + 10x + 3$ over the interval $1 \leq x \leq 2$ (5 mks)
- (c) Evaluate $\int \cos^2 x \sin^3 x dx$ (5 mks)
- (d) Evaluate $\int \cos^3 \theta d\theta$ (5 mks)