



(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2015/2016 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER

MAIN EXAMINATION

**FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS) AND BACHELOR OF EDUCATION**

COURSE CODE: MAT 221

COURSE TITLE: CALCULUS II

DATE: 6/5/16

TIME: 2 PM -4 PM

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 (30 MARKS)

- (a)(i) Find the 4th degree Taylor Polynomial of $\ln x$ at $x = 5$ [4mks]
- (ii) Let $z = \left(\frac{x}{y}\right) \sin(x^2 y^3)$, calculate $\frac{dz}{dx}$ and $\frac{dz}{dy}$. [4mks]
- (iii) Evaluate (i) $\int \frac{\cos 2x}{\sin^3 2x} dx$ [3mks]
- (ii) $\int \frac{e^{\sqrt{x-3}}}{\sqrt{x}} dx$ [2mks]
- (iv) Find a number C that satisfies the conclusion of the mean value theorem for the function $f(x) = \sin x$; $a = 0$ and $b = \frac{\pi}{2}$ [2mks]

- (b)(i) Find the volume of the solid generated by revolving the region bounded by $y = x^{\frac{2}{3}} + 1$; $0 \leq x \leq 8$, about the y-axis. [4mks]

- (ii) Evaluate the iterated integral $\int_{\alpha}^1 \int_{\sqrt{x}}^{x+1} 2xy dy dx$ [4mks]

- (iii) Find the length of the curve $y = \frac{4\sqrt{2}}{3} x^{\frac{3}{2}} - 1$ from $x = 0$ to $x = 1$ [4mks]

- (iv) Evaluate $\int \frac{x dx}{\sqrt{4-x^2}}$ [3mks]

QUESTION TWO (20 MARKS)

- (a) Compute the following integrals

(i) $\int \frac{dx}{x^2+6x-7}$ [6mks]

(ii) $\int_0^1 \frac{1+x}{1-x} dx$ [4mks]

- (b) Find a number C, that mean value theorem guarantees its existence, given that $F(x^3, a = 2$ and $b = -2$ [4mks]

- (c) Find the distance travelled between $t = 0$ and $t = \frac{\pi}{2}$ by a particle $p(x, y)$ whose position at time t is given by $x = \sin^2 t, y = \cos^2 t$ [6mks]

QUESTION THREE (20 MARKS)

- (a) Find $\frac{\partial f}{\partial y}$ if $f(x, y) = e^x \ln(x^2 + y^2 + 1)$ [6mks]
- (b) Find the volume of the solid under the surface the surface $z = x^2 + y^2$ and lying above the region. $\Omega = \{(x, y): 0 \leq x \leq 1 \text{ and } x^2 \leq y \leq \sqrt{x}\}$ [7mks]
- (c) Evaluate the indefinite integral $\int \sin^2 x \cos^4 x dx$ [7mks]

QUESTION FOUR (20 MARKS)

- (a) Find the area outside the circle $r=a$ and inside the circle $r = 2a \cos \theta$ [6mks]
- (b) Evaluate the integrals
- (i) $\int \sin x^{-1} x dx$ [4mks]
- (ii) $\int_0^{\frac{\pi}{2}} \cos^5 x dx$ [6mks]
- (c) Find the area of the surface obtained by revolving the $y = \sqrt{x}$ $0 < x < 2$ about the x-axis [4Mks]

QUESTION FIVE (20 MARKS)

- (a) Find the area of the cardioid $r = 1 - \cos \theta$ [5mks]
- (b) The are between the curve $y^2 = 2$ and the line $x = 9$ is revolved about the line $x = 9$. Find the volume of the solid generated. [5mks]
- (c) The parabola $y=4x$ is revolved about the x-axis, between $x=0$ and $x=4$. Find the moment of inertia of the solid of revolution generated, wit respect to a plane through the origin perpendicular to the x-axis. [5mks]
- (d) Evaluate $\int \frac{(x^3+x-1)}{x^2+x^4} dx$ [5mks]