

18



*(Knowledge for Development)*

**KIBABII UNIVERSITY**  
**UNIVERSITY EXAMINATIONS**  
**2019/2020 ACADEMIC YEAR**  
**FIRST YEAR SECOND SEMESTER**  
**SUPPLEMENTARY/SPECIAL EXAMINATION**  
**FOR THE DEGREE OF BACHELOR 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

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

**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)  $\int_0^{\frac{\pi}{2}} x^2 \sin x dx$  (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)