



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS**

**UNIVERSITY EXAMINATION FOR THE DIPLOMA IN LINUX ENGINEERING**

**1<sup>ST</sup> YEAR 1<sup>ST</sup> SEMESTER 2018/2019 ACADEMIC YEAR**

**KISUMU LEARNING CENTER**

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**COURSE CODE: SMA 2111**

**COURSE TITLE: DIFFERENTIAL AND INTEGRAL CALCULUS**

**EXAM VENUE:**

**STREAM:**

**DATE:**

**EXAM SESSION:**

**TIME:**

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### **INSTRUCTIONS**

- 1. Answer Question 1 (Compulsory) and ANY other TWO questions**
- 2. Candidates are advised not to write on the question paper**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room**

**Question 1 [30 marks]**

- a) Find the derivative of the following function using the definition of the derivative
- i)  $f(x) = x^3$  (3 marks)
- ii)  $f(x) = 2x^2$  (3 marks)
- b) Find
- i)  $\int x^2 dx$  (2 marks)
- ii)  $\int 2x^7 dx$  (3 marks)
- c) Let  $f(x) = x^5 - 6x^7$  find  $f'(x)$  (4 marks)
- d) Let  $f(x) = 2x(x^2 - 5x + 7)$ . Find the derivative of  $f$  at 2 (4 marks)
- e) Find
- i)  $\int_0^1 5x^2 dx$  (3 marks)
- ii)  $\int_1^2 (3 - x) dx$  (3 marks)
- f) Let  $y = \frac{2x^2 - 3}{\sqrt{x}}$ . Find  $\frac{dy}{dx}$  (5 marks)

**Question 2 [20 marks]**

- a) Let  $f(x) = \frac{x^3 - 1}{x}$ . Find  $f'(3)$  and  $f''(-4)$  (10 marks)
- b) Perform the following integration  $\int (2x - 3)(x^2 + 1) dx$  (10 marks)

**Question 3 [20 marks]**

- a) Evaluate the following integral using the substitution method.

$$\int \frac{2t^3 + 1}{(t^4 + 2t)^3} dt \quad (10 \text{ marks})$$

- b) Use the Chain Rule to differentiate  $R(z) = \sqrt{5z - 8}$  (10 marks)

**Question 4 [20 marks]**

- a) Differentiate  $y = (1 - 3x)^{\cos(x)}$  (10 marks)
- b) Determine the absolute extrema for the following function and interval.  
 $Q(y) = 3y(y + 4)^{\frac{2}{3}}$  (10 marks)

**Question 5 [20 marks].**

a) Determine the area of the region bounded by  $y = 2x^2 + 10$ ,  $y = 4x + 16$ ,  $x = -2$  **(10 marks)**

b) Evaluate the following limit.  $\lim_{x \rightarrow \infty} x^{\frac{1}{x}}$  **(10 marks)**