



**ALUPE UNIVERSITY
COLLEGE**
Pursuing the Frontiers of Knowledge...

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**OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH**

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATION

**FOR THE DEGREE OF BACHELOR
OF SCIENCE IN COMPUTER SCIENCE
/APPLIED STATISTICS WITH
COMPUTING
SCHOOL: SCIENCE**

COURSE CODE: MAT 110

COURSE TITLE: BASIC CULCULUS

DATE: 18th December, 2017 TIME: 9.00am-12.00pm

For examiner's Use Only

Question	I.E	E.E
CAT		
EXAM		
TOTAL		

INSTRUCTION TO CANDIDATES: SEE INSIDE

THIS PAPER CONSISTS OF 20 PRINTED PAGES

PLEASE TURN OVER

Insert the numbers of the questions you have answered in the order done

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Student Admission No.....Exam Card No.....Signature.....



INSTRUCTIONS TO CANDIDATES

1. Write your **Admission Number, Exam Card Number** and **Sign** in the spaces provided at the bottom of each page of the Examination Booklet. **DO NOT** write your name anywhere in this booklet.
2. Write on both sides of the pages.
3. All rough work must be done in the Answer sheets and crossed through.
4. If supplementary pages are used, they must be fastened all together at the end of this Booklet. Supplementary pages should be used only after all the leaves in the booklet have been exhausted.
5. It is a serious examination offence to cheat or to have unauthorized materials including **MOBILE PHONES** (whether on or off) in the examination venue.
6. In no circumstances must Answer Booklet used or unused, be removed from the examination room by a candidate.
7. The Booklet is for **Examination use only** in a designated examination room. Unauthorized possession of the Answer sheets by a student or any other person constitutes an examination irregularity calling for stiff disciplinary action.
8. Do not pluck any page from this Booklet. Any extra/unused answer sheets should be returned to the **Examination Office**.
9. Candidates who come to examination room 30 minutes late will not be allowed to sit for the exam.
10. Candidates will not be allowed to leave the exam room once the exam commences.
11. Candidates are advised that importance is attached by examiners to accuracy and clarity of expression.
12. Committing any form of irregularity is prohibited and shall attract severe disciplinary action in accordance with Alupe University College Examination Regulations.

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INSTRUCTION TO CANDIDATES

Answer ALL questions from section A and any THREE from section B
DO NOT WRITE ANYTHING ON THIS QUESTION PAPER

SECTION A [31 Marks] ANSWER ALL QUESTIONS**QUESTION ONE [16 marks]**

a) Evaluate the following limits

i. $\lim_{x \rightarrow 2} \frac{x^2 - 4}{x - 2}$ [2mks]

ii. $\lim_{x \rightarrow \infty} \frac{2x^3 - 3x}{5x^3 + 3}$ [2mks]



b)

i. Define the term continuous [2mks]

ii. Determine whether or not the function below is continuous at $x=1$

$$f(x) = \begin{cases} \frac{x^2 - 1}{x - 1}; & x \neq 1 \\ 2; & x = 1 \end{cases} \quad [3mks]$$

c) Find the equation of the tangent and the normal to the curve $x^2 + xy - y^2 = 1$ at the point (2,3) [3mks]

d) A circular hole 10cm in diameter and 30cm deep metal is rebored to increase the diameter to 10.3cm. Estimate the amount of metal to be removed. Use MVT [4mks]

QUESTION TWO [15 marks]a) Evaluate the integral $\int_2^4 (x^3 + 2x - 7) dx$ [4mks]b) The gradient function of a curve is given by $\frac{dx}{dy} = 3x^2 + 5$. Given that the curve passes through the point (1, 8); determine the equation of the curve. [4mks]

c) Differentiate the following with respect to x

i. $y = \ln(\ln x)$ [3mks]

ii. $y = \sin(2x^2 + 3)$ [4mks]

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SECTION B [39mks]: ANSWER ANY THREE QUESTIONS**QUESTION THREE [13 marks]**

- a) Define the continuity of a real valued function at a point $x=a$ [3mks]
 b) Determine the points where the following function is discontinuous

$$f(x) = \frac{x+2}{x^2+2x-3} \quad [3mks]$$

- c) Evaluate the following integral $\int \frac{x^3+2x+1}{x^3} dx$ [4mks]
 d) A curve passes through the point (3,-2) and its gradient function is $2x-5$. Find its equation. [3mks]

QUESTION FOUR [13 marks]

- a) A ball is thrown vertically upwards and its height after t seconds is S meters, where $S = 20t - 5t^2$. Find
- The greatest height reached and the time it is reached [2mks]
 - The time when it returns to the original levels [3mks]
 - Its velocity after 3s [2mks]
 - The acceleration when $t=1.8s$ [3mks]
- b) Evaluate the $\lim_{x \rightarrow 2} \frac{2x^2 - 3x - 2}{3x^2 - 2x - 8}$ [3mks]

QUESTION FIVE [13 marks]

- a) Differentiate the following function using the chain rule $y = (x^2 + 4x - 5)^6$ [4mks]
 b) Find the turning points on the graph of $y = 2x^3 + 9x^2 - 24x - 56$ and distinguish between them [6mks]
 c) Find the area under the curve $y = x^2 - 4x + 5$ between $x=-1$ and $x=2$ [3mks]

QUESTION SIX [13 marks]

- a) Find the values of

i. $\frac{dy}{dx}$ [2mks]

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ii. $\frac{d^2y}{dx^2}$ [2mks]

From the function $y = 9x^6 + 5x^2 + 4x^4 + 3x^3 + 2x^2 + 6x - 7$

- b) Suppose that $f(x) = x^{1/2} - x^{3/2}$ is continuous on $[0, 1]$, find the number c that satisfies the conclusion of Rolle's Theorem. [4mks]
- c) Find the equation of the normal curve $x = t + \frac{1}{t}, y = t - \frac{1}{t}$ at the point $t=2$ and find the point where this normal meets the curve again [5mks]

QUESTION SEVEN [13 marks]

- a) Find and classify the stationary points on the curve $y = x^3 - 3x^2 - 9x + 2$ [8mks]
- b) Differentiate the function $y = 3e^{2x+1}$ [3mks]
- c) Given that $f(x) = \frac{x-1}{x^2+2}$. Find $f\left(\frac{1}{2}\right)$ [2mks]



