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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:** 18<sup>th</sup> December, 2017 **TIME:** 9.00am-12.00pm

For exami	ner's Us	e Only
Question	I.E	E.E
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<b>INSTRUCTION T</b>	O CANDIDATES	: SEE INSIDE

THIS PAPER CONSISTS OF 20 PRINTED PAGES

PLEASE TURN OVER

Insert th	e numbers	of the q	uestions	you hav	e answe	red in the	e order d	lone	
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Student Admission No......Exam Card No.....Signature.....



MAT 110 HX3YP

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- 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.
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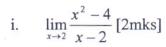
#### INSTRUCTION TO CANDIDATES

## 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



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



b)

i. Define the term continuous

[2mks]

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

$$f(x) = \begin{cases} \frac{x^2 - 1}{x - 1}; x \neq 1 \\ 2; x = 1 \end{cases}$$
 [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)
- 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.  $y = \ln(\ln x)$ 

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

$$f(x) = \frac{x+2}{x^2 + 2x - 3}$$
 [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
  - i. The greatest height reached and the time it is reached
    ii. The time when it returns to the original levels
    iii. Its velocity after 3s
    iv. The acceleration when t=1.8s
- b) Evaluate the  $\lim_{x\to 2} \frac{2x^2 3x 2}{3x^2 2x 8}$  [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]

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