MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
SECOND YEAR FIRST SEMESTER
B.Sc. COMPUTER SCIENCE
SCHOOL OF SCIENCE
COURSE CODE: ECO 1102
COURSE TITLE: DIFFERENTIAL CALCULUS

DATE: 3ʀᴅ DECEMBER, 2018   TIME: 1100 - 1300 HOURS

INSTRUCTIONS TO CANDIDATES

Answer **ALL** questions in **Section A** and **ANY** Other **TWO** questions from **Section B**

DO NOT MAKE ANY WRITING ON THIS QUESTION PAPER

This paper consists of **THREE** printed pages. **Please turn over.**

SECTION A (30 MARKS)

Question one (30 Marks)

a. Evaluate

    i. $\lim\limits_{x \to 2} \dfrac{x^2-4}{x-2}$ **(3 Marks)**

    ii. $\lim\limits_{x \to \infty} \dfrac{3x+5}{6x-8}$ **(3 Marks)**

b. Use L'Hospitals rule to evaluate the following

    i. $\lim\limits_{x \to 1} \dfrac{x^3-1}{x-1}$ **(3 Marks)**

    ii. $\lim\limits_{x \to 0} \dfrac{\cos x-2x-1}{3x}$ **(2 Marks)**

c. Find the derivatives of the following functions from the first principles

    i. $f(x) = \sqrt{x}$ **(4 Marks)**

    ii. $f(x) = \dfrac{1}{x^2}$ **(4 Marks)**

d. Differentiate the following functions

    i. $g(t) = \sqrt{t^2 + 1}$ **(4 Marks)**

    ii. $g(t) = \left(\dfrac{t}{1+t}\right)^5$ **(4 Marks)**

e. Find y' given $x + xy - 2y = 1$ at the point (1,3)   **(3 Marks)**

SECTION B (40 MARKS)

Question two (20 Marks)

a. Find the value of y' and y'' at the point $(-1,1)$ of the curve
$x^2 y + 3y = 4$ **(6 Marks)**

b. Find the gradient $\frac{dy}{dx}$ at the point $(1,2)$ on the curve whose equation is
$x^3 - 5xy^2 + y^3 + 11 = 0$ **(4 Marks)**

c. Find the equation of the tangent line to the curve $x = \sqrt{t}$, $y = t - \frac{1}{\sqrt{t}}$ at
the point $t = 4$ **(6 Marks)**

d. Find the inverse of the function $f(x) = \frac{5x+7}{3x+2}$ Hence solve $f'(2)$
(4 Marks)

Question three (20 Marks)

a. Given $x = a \cos t$, $y = b \sin t$ $0 \leq t \leq 2\pi$. find $\frac{d^2y}{dx^2}$ provided $\sin t \neq 0$
(8 Marks)

b. Prove that the lines tangent to the curves $5y - 2x + y^3 - x^2 y = 0$ and
$2y + 5x + x^4 - x^3 y^2 = 0$ at the origin intersect at right angles
(8 Marks)

c. A body moves along a straight line to the law $s = \frac{1}{2}t^3 - 2t$. Determine
its velocity, acceleration and the total distance travelled at the end of 2
second **(4 Marks)**

Question four (20 Marks)

a. Given the function $y = 2e^{2t}$, Show that $y'' - 4y = 0$ **(3 Marks)**
b. Show that $y'' + 4y = 0$ if $y = 3 \sin(2x + 3)$ **(3 Marks)**
c. Given $xy + e^y = 0$, Find y' and y'' in terms of x and y only **(6 Marks)**
d. Gas is escaping from a spherical balloon at the rate of $2ft^3/min$
How fast is the surface area shrinking when the radius is $12ft$?
(8 Marks)

****END****