MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
FIRST YEAR SECOND SEMESTER

SCHOOL OF SCIENCE
BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION

COURSE CODE: MAT 1207
COURSE TITLE: INTEGRAL CALCULUS

DATE: 16TH APRIL 2019　　　　　　　　　**TIME: 1100 - 1300 HRS**

INSTRUCTIONS TO CANDIDATES

1. Answer Question **ONE** and any other **two** questions.
2. All Examination Rules Apply.

Question One

a) Find

i.) $\int_1^2 \frac{x^2 + 3x - 2}{\sqrt{x}} dx$ (3 marks)

ii.) $\int (x-1)^5 + 3(x-1)^2 + 5 dx$ (3 marks)

iii.) $\int x \ln x^2 dx$ (3 marks)

iv.) $\int \frac{1-x}{1+x^2} dx$ (3 marks)

v.) $\int \frac{1}{x^2 - 4x + 13} dx$ (4 marks)

b) Express in partial fractions the expression $\frac{5x-3}{(x+1)(x-3)}$. Hence or

otherwise find $\int \frac{5x-3}{(x+1)(x-3)} dx$

(4 marks)

c) It is estimated that t years from now the population of a certain lakeside community will be changing at the rate of $0.6t^2 + 0.2t + 0.5$ thousand people per year. Environmentalists have found that the level of pollution in the lake increases at the rate of approximately 5 units per 1000 people. By how much will the pollution in the lake increase during the next 2 years? (4 marks)

d) Determine the volume generated when the area above the axis bounded by the curve $x^2 + y^2 = 9$ and the ordinates $x = 3$ and $x = -3$ is rotated one revolution about the x-axis.

(3 marks)

a) Evaluate $\iint_R f(x,y) dA$

where $f(x,y) = 1 - 6x^2y$ R: $\begin{array}{c} 0 \le x \le 2 \\ -1 \le y \le 1 \end{array}$

(3 marks)

Question Two

a) Find $\int \sin x \cos^4 x\, dx$, hence evaluate $\int_0^{\pi/6} \sin x \cos^4 x\, dx$ (6 marks)

b) Find the area between the curves $y = x^2 + 1$ and $y = 7 - x$

          (6 marks)

c) Evaluate

    i.) $\int_1^4 x^2 \ln x\, dx$ (4 marks)

    ii.) $\int_0^{\pi/4} \sqrt{1 + \tan^2 x}\, dx$ (4 marks)

Question three

a) Find $\int \dfrac{dx}{x\left(x^2 + 1\right)^2}$ (10 marks)

b) A particle moves in a straight line such that its velocity in ms^{-1}, t seconds after passing a fixed point O is given by $v = 3\cos t - 2\sin t$. Find its displacement from O after $\dfrac{1}{2}\pi s$ and the velocity of the particle at this instant.

          (5 marks)

c) Evaluate $\int_1^5 \dfrac{x}{\sqrt{2x - 1}}\, dx$ (5 marks)

Question four

a) Find $\int_0^1 \int_x^1 \int_0^{y-x} F(x, y, z)\, dz\, dy\, dx$ where $F(x, y, z) = 1$.

          (6 marks)

b) Find

    i. $\int e^{2x} \cos x\, dx$ (6 marks)

    ii. $\int \dfrac{x^2}{\sqrt{9 - x^2}}\, dx$ (6 marks)

c) If $f(x, y) = e^{x^2 + xy}$ compute $\dfrac{\partial f}{\partial x}$ and $\dfrac{\partial f}{\partial y}$ (2 marks)