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.) $\int \ln x^2\,dx$ **(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 $x=3 \text{ and } x=-3$ 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: $0 \leq x \leq 2$, $-1 \leq y \leq 1$

(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 $\int \frac{dx}{x\left(x^2+1\right)^2}$ **(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 $\frac{1}{2}\pi s$ and the velocity of the particle at this instant.

(5 marks)

c) Evaluate $\int_{1}^{5} \frac{x}{\sqrt{2x-1}} dx$ **(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. $\int_{0}^{2x} \cos x\, dx$ **(6 marks)**

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

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