MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR FIRST SEMESTER EXAMINATION FOR DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

SMA 0201: INTEGRAL CALCULUS

Date: 30/8/2017 **Time: 8:30 – 10:30 AM**

INSTRUCTIONS

Answer Question One and Any Other Two Questions

QUESTION ONE

a) Define the definite integral as a limit sum. (2 marks)

b) Using the definition of an integral as a limit sum, calculate the following integral $\int_2^3 x^2 dx$. (6 marks)

c) Evaluate $\int_1^5 (5x^4 + 4x^3 - 3x^{-2})\, dx$ (5 marks)

d) Evaluate $\int (3sinx - 3tanx)dx$ (6 marks)

e) State the fundamental theorem of calculus, and define the term "anti-derivative". (5 marks)

f) Prove that $\int e^x dx = e^x + C$ (6 marks)

QUESTION TWO

a) Evaluate $\int (sinx \cdot cosx)dx$ (5 marks)

b) Find an equation for the curve that passes through the point (1,0) and has a slope function given by $x^3 - 2x + 1$. (5 marks)

c) Find the area of the curve bound by the x-axis and the curve of the function $f(x) = e^x + 1$, over the interval of $-2 \leq x \leq 2$.(5 marks)

d) Find the area of the region bound by the parabola $y = x^2$ and the line $y = x + 2$. (5 marks)

QUESTION THREE

a) Using the integration by parts method, evaluate $\int xe^x dx$ (5 marks)

b) Determine:

a. $\iint \ln x \, dxdx$ (5 marks)

b. $\int xsinx \, dx$ (5 marks)

c) A particle moves along a line, so that its velocity at time $t$is $v(t) = t^3 - 2t + 3$, measured in meters per second. Find the displacement of the particle during the time period $2 \leq t \leq 4$. (5 marks)

QUESTION FOUR

a) Find the area of the combined region that lies between the x-axis and the graph of $y = xe^{-x^2}$ for the interval$-1 \leq x \leq 2$. (5 marks)

b) Evaluate $\int x \cdot \ln x \, dx$ (5 marks)

c) Using the substitution method, evaluate the integrals for the following functions

i. $f(x) = \frac{\ln x}{x}$. (5 marks)

ii. $\int_0^1 x^2 e^{x^3} \, dx$ (5 marks)

QUESTION FIVE

a) Evaluate $\int \left(\frac{x+1}{x^2-2x-3}\right) dx$. (6 marks)

b) Find the cost function if the marginal cost of a product is given by the relation $3 - 6x + 4x^2$ and the fixed cost is 50. (6 marks)

c) Water flow from the bottom of a storage tank at a rate of $r(t) = 150 - 5t$ liters per minute, where $0 \leq t \leq 30$. Find the amount of water that flows from the tank during the last 15 minutes. (8 marks)