



MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)

University Examinations 2015/2016

SCHOOL OF EDUCATION

DEPARTMENT OF EDUCATIONAL ADMINISTRATION AND PLANNING

.....SEMESTER EXAMINATION FOR DIPLOMA IN EDUCATION

SMA 0201: INTEGRAL CALCULUS

Date:

Time:

INSTRUCTIONS

Answer Question One and Any Other Two Questions.

Show all your working

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 $\int_0^1 x^3 dx$.
Given that $1^3 + 2^3 + 3^3 + \dots + n^3 = \frac{n^3(n+1)^2}{4}$ (5 marks)
- c. Evaluate $\int_1^6 \left(\frac{3}{x^3} + \frac{2}{x^2} \right) dx$ (4 marks)
- d. State the fundamental theorem of calculus, and define the term “anti-derivative”. (4 marks)
- e. Evaluate the integrals for the following functions
- i. $f(x) = 2 \sin x - \cos x$ (3 marks)
- ii. $g(t) = \ln x + 1/x$ (4 marks)
- f. 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 $-2 \leq x \leq 2$. (8 marks)

Question Two

- a. Find the area of the region bound by the parabola $y = x^2$ and the line $y = x + 2$. (8 marks)
- b. Find an equation for the curve that passes through the point (1,0) and has a slope function given by $x^3 - 2x + 1$. (7 marks)
- c. Evaluate $\int x \cos x \, dx$ (5 marks)

Question Three

- a. Find the cost function if the marginal cost is $4 + 40x - 5x^2$ and the fixed cost is 50. (6 marks)
- b. A particle moves along a line, so that its velocity at time t is $v(t) = t^2 - 2t + 3$, measured in meters per second. Find the displacement of the particle during the time period $2 \leq t \leq 4$. (7 marks)
- c. An insecticide kills bacterial at the rate of $r(t) = 650 - 5t^2 + 0.5t$ insects per hour, where $0 \leq t \leq 99$. Find the number of insects killed during the interval $t=18$ hours and $t=23$ hours. (7 marks)

Question Four

- a. Using the appropriate method, evaluate the integrals for the following functions
- i. $f(x) = \frac{\ln x}{x}$. (5 marks)
- ii. $\int_0^1 (x+1)e^{x^2+2x} \, dx$ (5 marks)
- b. 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)
- c. Determine $\iint \ln x \, dx$ (5 marks)

Question Five

- a. Evaluate $\int \left(\frac{x-1}{x^2-2x-3} \right) dx$. (6 marks)
- b. Evaluate $\int x e^x \, dx$. (6 marks)
- c. Evaluate the $\iiint (x-2) dx dx dx$ (8 marks)