MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST SEMESTER EXAMINATION FOR DEGREE IN

BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE
BACHELOR OF SCIENCE IN STATISTICS AND PROGRAMMING
BACHELOR OF ECONOMICS AND STATISTICS
BACHELOR OF SCIENCE IN MATHEMATICS
BACHELOR OF ECONOMICS AND FINANCE
BACHELOR OF EDUCATION SCIENCE
BACHELOR OF EDUCATION ARTS

SMA 200: CALCULUS II

DATE: 9/8/2016 **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS:

Answer Question One and Any Other Two Questions

QUESTION ONE (30MARKS)

a) Use a suitable technique to evaluate the following ;

i) $\int (1-x)^{\frac{1}{2}}\ x^2\,dx$ (5 marks)

ii) $\int_0^{\pi} \sin 8x \sin 3x\,dx$ (4 marks)

iii) $\int \frac{\sinh x}{1+\cosh x} dx$ (3 marks)

iv) $\int \frac{dx}{\sqrt{25-16x^2}}$ (3 marks)

b) Consider the integral $\int_0^{\pi} x e^{-x}\,dx$;

Show that the integral is convergent (5 marks)

c) Determine the surface area generated by the Loop of the curve $x = t^2$, $y = t - \frac{t^3}{3}$ about the x-axis (5 marks)

d) Calculate the volume of the solid generated when the region bounded by $y^2 = 4x$ and $y=2x -4$is revolved about the y-axis (5 marks)

QUESTION TWO (20 MARKS)

a) Consider a disk of radius *a units* with center at the origin with the density function y . Calculate the center of mass of the disk's first quadrant part. (10mks)

b) Evaluate $\int \frac{x^3+9}{x\left(x^2+x+9\right)^2} dx$ (10mks)

QUESTION THREE (20 MARKS)

a) Consider the curve $y = \frac{1}{x}$ within the domain $1 \le x \le 2$. The interval is divided into 5 equal parts.

i) Calculate $\int_1^2 \frac{1}{x} dx$ using Simpsons rule with 5 equal intervals. (5 marks)

ii) Suppose that you know $\int_1^2 \frac{1}{x} dx = \ln x + c$, calculate the exact area under the curve. (3 marks)

iii) Calculate the percentage error in approximating the area under the curve using Simpson's rule.

(4 marks)

b) Use inverse trigonometric method to determine $\int \frac{x^3}{x^2-2x+4}dx$ (8 marks)

QUESTION FOUR (20MKS)

a) State the fundamental theorem of integral calculus. (2 marks)

b) Evaluate ;

i) $\int \frac{x^2}{(4-x^2)^{\frac{5}{2}}}\ dx$

(8mks)

ii) $\int x\cos(5x-1)dx$

(7mks)

c) Calculate the area under the curve $y=\frac{1}{x\sqrt{x^2-1}}$ above the segment $(\sqrt{2}\ ,\ 2)$on the x-axis (3 marks)

QUESTION FIVE (20 MARKS)

a) Calculate the length of the arc of a parabola $y^2=4ax$ cut off by its latus rectum.

(5 marks)

b) A ball is rolled in a straight line over a level lawn, with initial velocity of $10m/s$. If because of friction the velocity decreases at the rate of $4m/s^2$, calculate the distance the ball rolls to a stop.

(4 marks)

c) Determine the following indefinite integrals;

i) $\int x^2\ln x\,dx$ (5 marks)

ii) $\int\cos^4 x\sin^2 x dx$ (6 marks)