KIRIRI WOMENS' UNIVERSITY OF SCIENCE AND TECHNOLOGY
UNIVERSITY EXAMINATION, 2016/2017 ACADEMIC YEAR
SECOND YEAR, SECOND SEMESTER EXAMINATION
FOR THE DEGREE OF BACHELOR OF SCIENCE
(MATHEMATICS)

Date: 10th August, 2016.

Time: 11.00am – 1.00pm

KMA 201 – CALCULUS II

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTIONS

QUESTION ONE (30 MARKS)

a)   Use the mean value theorem to estimate the value of $\sqrt[3]{130}$.

(4 Marks)

b)   Evaluate the following integrals;

   i) $\int 8x^3(2 - x^4)^6 dx$

(3 Marks)

   ii) $\int \sqrt{4 - x^2}\, dx$

(4 Marks)

   iii) $\int_0^{\frac{\pi}{4}} \frac{10\sec^2 x}{(\sqrt{\tan x})^5} dx$

(6 Marks)

   iv) $\int \sin^3 x \cos x\, dx$

(4 Marks)

   v) $\int \cos^3 x\, dx$

(4 Marks)

c)   Find the following Taylor's polynomials for; $f(x) = \frac{2}{1-x}$

   i) $P_{1,0}(x)$

(3 Marks)

   ii) $P_{3,0}(x)$

(2 Marks)

QUESTION TWO (20 MARKS)

a) i) State Rolle's Theorem

(3 Marks)

ii) Determine if the function $f(x) = 3\sin(2x)$ on $[0, \pi]$ satisfies the hypothesis of Rolle's Theorem hence find all possible points c that satisfies the conclusion on the given interval.

(5 Marks)

b) Evaluate the integral;

i) $\int \frac{5x-4}{2x^2+x-1} dx$

(6 Marks)

ii) $\int \frac{16}{x^2-4x+8} dx$

(6 Marks)

QUESTION THREE (20 MARKS)

a) Evaluate the following integrals;

i) $\int (\tan x + \sec x)^2 \, dx$

(4 Marks)

ii) $\int \frac{x}{1-x^2} dx$

(2 Marks)

iii) $\int \frac{x^2+2x-1}{x^3-x} dx$

(6 Marks)

iv) $\int \sin^3 x \cos^2 x \, dx$

(4 Marks)

b) Evaluate; $\int_0^{\frac{\pi}{4}} \cos^4 x \, dx$

(4 Marks)

QUESTION FOUR (20 MARKS)

a) i) State the mean value theorem

(3 Marks)

ii) Find the value of c such that the conclusion of mean value theorem is satisfied for;

$$f(x) = -2x^3 + 6x + 2 \text{ on } [-2, 2]$$

(5 Marks)

b) Show that; $\int \frac{7}{4+4x^2} dx = \frac{7}{2}\tan^{-1}\left(\frac{x}{2}\right) + c$

(4 Marks)

c) Evaluate the integrals; $\int \frac{\sqrt{9-x^2}}{x^2} dx$

(4 Marks)

d) Find the area bounded by; $y = 1 + x^2$ and $y = 3 + x$.

(4 Marks)

QUESTION FIVE (20 MARKS)

a)   Evaluate the integrals;

   i) $\int 12xe^{4x^2+2}dx$

   (4 Marks)

   ii) $\int e^x \sin x \; dx$

   (5 Marks)

   iii) $\int \sec^2 x \tan^3 x \; dx$

   (4 Marks)

b)   Consider the region enclosed by the curves $x = y^2$ and $x = 2 - y^2$. Find the volume when the region is rotated about the line $x = 4$.

   (7 Marks)