##  JOMO KENYATTA UNIVERSITY

 **OF AGRICULTURE AND TECHNOLOGY**

# University Examinations 2016/2017

**YEAR THREE SEMESTER TWO EXAMINATIONS FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE**

**SMA 2200: CALCULUS III**

**DATE: APRIL 2017 TIME: 2 HOURS**

**INSTRUCTIONS: ANSWER QUESTION ONE (COMPULSORY) AND ANY TWO QUESTIONS**

**QUESTION ONE (30 MARKS)**

a) Given f(x)=3x2-12x+11, find the value of c guaranteed by the Rolle’s theorem in the interval [0, 4] (3 marks)

b) Find the value of c guaranteed by the mean value theorem given the function f(x)=x2 in any interval [a$\leq x\leq b]$ (4 marks)

c) Use L’Hospitals rule to find

 lim  (4 marks)

 x

d) Use Machaurin’s theorem to find the series expansion of f(x)=ex up to the term containing x3 (4 marks)

e) Evaluate without using tables (5 marks)

f) Evaluate the double integral where R is the rectangle IxI$\leq I$, I$\leq y\leq 2$ (5 marks)

g) Show that for every convergent series un,

 lim un =0

 n (5 marks)

**QUESTION TWO (20 MARKS)**

a) Evaluate (x+y+z)dxdydz, where R:0$\leq $x$\leq $, 1$\leq y\leq 2$, 2$\leq z\leq 3$

 (4 marks)

b) By changing to polar coordinates evaluate  over the positive Quadrant of the circle x2+y2=a2 (6 marks)

c) i) State the Rolle’s theorem (2 marks)

 ii) Verify Rolle’s theorem for the function f(x)=x2-11x+24 in the interval [3$\leq x\leq 8]$ (4 marks)

d) Evaluate lim  (4 marks)

 x

**QUESTION THREE (20 MARKS)**

a) i) Define an infinite series (1 mark)

 ii) State any two properties of an infinite series (2 marks)

b) Use Cauchy’s fundamental test for divergence to test the convergence of the series

  (4 marks)

c) i) State ∆’ Alembent’s ratio test (2 marks)

 ii) Using ∆’ Alembent’s ratio test or otherwise, test for convergence the series whose nth term is  (4 marks)

d) i) State the lagrange’s mean value theorem (2 marks)

 ii) Verify Langrange’s mean value theorem for the function f(x)=x2-x- 12 in [0$\leq x\leq 1]$ (5 marks)

**QUESTION FOUR (20 MARKS)**

a) Express  using chain rule as a function of t given that w=x2+y2, x=cost, y=suit (4 marks)

b) i) Let f=f(x, y) be a function of two independent variables. State two conditions required for the function f to have extreme values

 (2 marks)

 ii) Explain how you will distinguish between the maximum and minimum point of the function f(x, y) (2 marks)

c) Find the maximum or minimum values of f(x, y)= xy(6-x-y) (8 marks)

d) Evaluate the improper integral without using tables (4 marks)