

**W1-2-60-1-6**

**JOMO KENYATTA UNIVERSITY**

 **OF**

**AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2014/2015**

**YEAR II SEMESTER I EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE**

**SMA 2200: CALCULUS III**

**DATE:DECEMBER 2014 TIME: 2 HOURS**

**INSTRUCTIONS** Answer question one and any other two questions.

**QUESTION ONE (30 MARKS) COMPULSORY**

a. i State the Rolles theorem. (2 marks)

 ii. Find the value of c for the function f(x)=x3 -4x guaranteed by the Rolle’s theorem on (0,2). (3 marks)

b. Use L’Hopitals rule to evaluate

  (3 marks)

c. Use Maclaurius theorem to find the series expansion of f(x) =cos x up to the term in x7. (4 marks)

d. Evaluate the following improper integral without using tables.

  (5 marks)

e. Evaluate , where R:0≤x≤1, 1≤y≤2, 2≤z≤3. (4 marks)

f. If xyz=c, where c is a constant, show that dz=-z ($\frac{dx}{x}$ +$\frac{dy}{y}$) (5 marks)

g. Use root test to determine if the series

 is convergent or divergent. (4 marks)

**QUESTION TWO (20 MARKS)**

a. i. State the mean value Theorem. (12 marks)

 ii. Find the value of c guaranteed by the mean value theorem for the function f(x)=x2 +2x-1 on (0,1) (4 marks)

b. i. Suppose f is continous on [a, b] and differentiable on (a,b). Prove that if f’(x) >0 for every x e(a, b) then f increases throughout (a,b) (4 marks)

 ii. Find the intervals on which f(x)=2+x-x2 increases and decreases. Hence, sketch the graph of this function. (4 marks)

c. Show that  cannot be evaluated at using L’Hopitals rule and evaluate it otherwise. (6 marks)

**QUESTION THREE (20 MARKS)**

a. i. Use Maclaurin theorem to find the series expansion of f(x) =(1-x) up to and including the term containing x4. (4 marks)

 ii. Use (i) above to expand ln $\frac{x}{x-1}$ as a series of descending powers of x as far as the term x-4. Use your expansion to find ln 1.2 correct to 4 decimal places. (6 marks)

b. i. Find the reduction formula for  (6 marks)

 ii. Use b (i) above to determine  correct to 2 decimal places.

 (4 marks)

**QUESTION FOUR (20 MARKS)**

a. Evaluate  over the region in the positive quadrant for which x+y≤1.

 (3 marks)

b. Change the order of integration in I= and hence evaluate the same.

 (6 marks)

c. Evaluate the integral by changing to polar coordinates  over the positive quadrant of x2 +y2=4. (6 marks)

d. Find the value of at t=-2 for the function f(x,y,z)=  if x=2+t, y=-t-1 and z=t. (5 marks)