JARAMOGI OGINGA ODINGA UNIVERSITY
OF SCIENCE & TECHNOLOGY
UNIVERSITY EXAMINATIONS 2012/2013

2ND YEAR 2ND SEMESTER FOR DIPLOMA IN
LINUX FOR ENGINEERING AND IT APPLICATIONS

(KISUMU L.CENTRE)

COURSE CODE: SMA 2121

TITLE: MATHEMATICS II

DATE: 15/8/13 **TIME: 9:00 – 10.30 AM**

DURATION: 1.30 HOURS

INSTRUCTIONS

1. **This paper consists of 5 Questions.**
2. **Answer Question 1 (Compulsory) and any other 2 questions.**
3. **Write your answers on the answer booklet provided.**

Question one (30 mks)

a. Define limit of a function. (1 mk)

b. State differentiability condition for a function f(x) at a point x = a. (1 mk)

c. If $f(x) = \frac{x+1}{x^2 - x - 2}$, for what values of x is f(x) continuous? (4 mks)

d. Find the gradient or derivative or gradient function of the following functions;

   i. $y = 3$ (2 mks)

   ii. $y = 3x^2 + \frac{1}{2}x^4 - 3x$ (3 mks)

e. Evaluate $\int 3x^2 dx$ (3 mks)

e. sketch the following turning points

   i. a maxima (1 mk)

   ii. a minima (1 mk)

f. the equation of a curve is given as $y = 2x^2 - 1$. Find the equation of

   i. the tangent to the curve at the point x = 1 (3 mks)

   ii. the normal to the curve at x = 1 (3 mks)

g. Determine the turning point of the curve whose equation is $y = x^2+2$ (4 mks)

h. The equation of motion of a car is given as $s = 2t^2 + 3t$. Write an expression of

   i. the velocity of the car. (2 mks)

   ii. The acceleration of the car. (2 mks)

Question two (20 marks)

a. Sketch the curve $y = x(x^2-3)$ (10 mks)

b. Given the equation of a curve is $y = 2x^2 + 3x + 1$, find the equation of

   i. the tangent to the curve at x = 2 (6 mks)

   ii. The normal to the curve at x = 2 (4 mks)

Question three (20 marks)

a. State the three conditions that are satisfied by a function f continuous at x = a (3 mks)

b. Differentiate the following functions:

i. $y = (x - 1)(x^2 - 2)$ (3 mks)

ii. $y = \frac{x}{x^2 + 2}$ (3 mks)

iii. $y = - - \frac{1}{2}$ (3 mks)

b. The volume of a cube is decreasing at the rate of 2 cm^3 per second. Find the rate of change of the side of the base when its length is 4 cm. (5 marks)

c. determine the vertical asymptotes of $y = \frac{1}{x^2 - 1}$ (3 mks)

Question four (20 marks)

a. The motion of a ball thrown vertically upwards is represented by the equation $s = 160t - 16t^2$ where s represents the height reached by the ball

i. find the maximum height reached by the ball (4 mks)

ii. the velocity of the ball at a height of 256 m (6 mks)

b. find the derivative of $y = e^{x^2+2}$ (3 mks)

c. sketch the curve whose equation is $y = x^4 - 32x$. (7 mks)

Question five (20 marks)

a. Evaluate the following

i. $\int_1^3 2x^2 dx$ (4 mks)

ii. $\int \frac{dx}{1 + 4x^2}$ (4 mks)

b. The acceleration of a body is given by $a = 3t^2 + 2t$. If v =0 at t = 0, find:

i. an expression for the velocity of the body. (3 mks)

ii.the distance covered by the body at t = 3. (4 mks)

c. Use integration method to show that the volume of a cone of radius r and altitude h is given by $\frac{\Pi r^2 h}{3}$. (5 mks)