JARAMOGI OGINGA ODINGA UNIVERSITY OF SCENCE AND TECHNOLOGY

SCHOOL OF INFORMATICS AND INNOVATIVE SYSTEMS

DIPLOMA IN LINUX ENGINEERING

COURSE CODE: SMA 2111

COURSE TITLE-DIFFERENTIAL AND INTEGRAL CALCULUS

EXAMINATIONS 2012/2013

TIME   2HRS

INSTRUCTIONS:

1) This paper contains five (5) questions.
2) Question ONE is Compulsory and any other TWO questions
3) Write the answers in the booklet provided

Question one 30 marks

1. (a) Define a function.   (2mks)

   (b) If $f(x) = 3x + 2$, find its inverse i.e. $f^{-1}(x)$ (3mks)

   (c) If $f(x) = 3x + 1$ and $g(x) = x^2 - 1$, find the composite of $(f°g)(x)$ (5mks)

   (d) Using the product rule differentiate $y = x^2(x^2 + 2x - 3)$.   (5mks)

   (e) Define the quotient rule.   (2mks)

   (f)

       a. Differentiate   (3mks)

   $$y = \frac{\cos x}{x}$$

   (g) Use the sum rule and what you know about the derivatives of $f(x) = mx + b$
       and $g(x) = x^n$ to find the derivatives of: (10mks)

       i. $f(x) = x^4 + x^3$

       ii. $f(x) = x^2 - 7x + 12$

Question two 20 marks

    a. Solve $2 \log_8 x = \log_8 16$ (3mks)

    b. Given the equation $\tan(x) = A \cos(x)$ where $A > 0$ is a constant, solve for
   $-\pi/2 \leq x \leq \pi/2$. **Hint:** $\tan(x) = \sin(x)/\cos(x)$.   (5mks)

    c. If g is the inverse of f and $f(x) = 1/(1 + x^n)$, then $g(x) = $ (3mks)

    d. Find the first derivative of $f(x) = x \sin x$ (3mks)

    e. Differentiate the following function   (6mks)

$$y = \frac{5e^x}{3e^x + 1}$$

Question three 20 marks

a. Evaluate

$$\int_0^2 10x^2 + 10\,dx$$

(3mks)

b. Evaluate the following definite integral.   (3mks)

$$\int_{130}^{130} \frac{x^3 - x\sin(x) + \cos(x)}{x^2 + 1}\,dx$$

c. Using substitution evaluate

$$\int_{-2}^{-6} \frac{4}{(1+2x)^3} - \frac{5}{1+2x}\,dx$$

(6mks)

d. Calculate y in y=log₄(1/4)   (4mks)

e. State four ways by which functions can be combined.   (4mks)

Question four 20 marks

f. If $f(x) = 3x + 1$ and $g(x) = x^2 - 1$
    Find the difference $f(x) - g(x)$
        (4mks)

g. Using substitution evaluate   (6mks)

$$\int_3^5 \frac{4t}{2 - 8t^2}\,dt$$

h. Simplify $\log_a((x^2+1)^4 \ x)$ (5mks)

i. Differentiate

$$g'(x) = e^{2x}\cos^2(1-5x)$$

(5mks)

Question Five 20 marks

j. Define differentiation (2mks)

k. Find x in $\log_3(x) = 5$ (5mks)

l. Evaluate

$$\int_{x^2}^{1} \frac{t^4+1}{t^2+1}dt$$

(6mks)

m. Find the product $f(x)g(x)$ given (f(x)= (3x + 1) and g(x)=(x_2 - 1) (3mks)

n. If the graph of $y = 3_x + 1$ is reflected about the y-axis, plot the graph. (3mks)