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(Knowledge for Development)

KIBABII UNIVERSITY
UNIVERSITY EXAMINATIONS
2015/2016 ACADEMIC YEAR
FIRST YEAR SECOND SEMESTER
MAIN EXAMINATION
FOR DIPLOMA IN EDUCATION
MATHEMATICS

COURSE CODE: EDM 104

COURSE TITLE: ANALYSIS AND CALCULUS I

DATE: 11/5/16

TIME: 9AM -11AM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS)

- a) Define the following terms as used in calculus
- i) A function
 - ii) Domain of a function
 - iii) Range of a function (4Marks)
- b) Indicate whether or not the following equations are functions
- i) $x^2 + y^2 = 1$ (2 marks)
 - ii) $Y = \frac{x}{2x + 1}$ (2 marks)
- c) Evaluate
- i. $\lim_{x \rightarrow 5} \frac{x^2 - 25}{x - 5}$ (3marks)
 - ii. $\lim_{x \rightarrow 3} \frac{3x + 1}{2x - 1}$ (3mrks)
- d) Find the equation of the tangent to the curve $y = x^3 + 4x$ at the point where $x = 2$ (3mks)
- e) Obtain the equation of a line that passes through a point $M(2,0)$ and parallel to the line $y = 2x + 3$ (2mrks)
- f) Differentiate the following functions from first principles of differentiation
- i) $Y = 2x + 3$ (3Mrks)
 - ii) $Y = 2x^2 + 3x + 2$ (3mrks)
- g) Determine the inverses of the functions below
- i) $y = \frac{x}{2x - 3}$ (2mrks)
 - ii) $y = \frac{1}{x^2} - 4$ (3Mrks)

QUESTION TWO (20 MARKS)

- a) Given that $f(x) = 25 - x^2$ and that $g(x) = \sqrt{x}$, find the values of
- i) $gf(0)$ (2marks)
 - ii) $gf(4)$ (2marks)
- b) Given that $F: X \rightarrow (10 + x)$, $G: x \rightarrow x^3$ and $H: x \rightarrow x/2$, write down the functions
- i) FG (2marks)
 - ii) GF (2marks)
 - iii) FGH (3marks)
- c) Investigate by calculation the function $f(x) = \frac{x^3 - 8}{x - 2}$, as $x \rightarrow 2$ (4 marks)
- d) Find from first principles, the derivative of the function $f(t) = kt^4$ where k is a constant. (5marks)

QUESTION THREE (20 MARKS)

A particle moves along a straight line in such a way that its distance from a fixed point O on the line after t seconds is S metres, where $S = \frac{1}{6}t^4$. Find

- a) Its velocity after 3s, and after 4s (3marks)
- b) Its average velocity during the 4th second (3marks)
- c) Its acceleration after 2s and after 4s (3marks)
- d) Its average acceleration from $t=2$ to $t=4$ (3marks)
- e) Find the area enclosed by the curve $y=x^3$, $x=1$, $x=3$ and the x -axis (4marks)
- f) If $f(x) = (x^2 + 3x)^7$, find $f'(x)$ (4marks)

QUESTION FOUR (20 MARKS)

- i) Differentiate $\frac{(x-3)^2}{(x+2)^2}$ (4marks)
- ii) Find the gradient of the curve $x^2 + 2xy - 2y^2 + x = 2$ at the point $(-4, 1)$ (4marks)

iii) If $x=t^3+t^2$, $y=t^2+t$, find dy/dx in terms of t . (5mrks)

iv) Find the gradient of the curve $x=t^{1+t}$, $y=t^3/_{1+t}$ at the point $(\frac{1}{2}, \frac{1}{2})$ (5mrks)

QUESTION FIVE (20 MARKS)

a) Integrate (2mrks)

i) $\cos 2x$ (2mrks)

ii) $3 \sin \frac{1}{2} x$

b) Differentiate (2mrks)

i) $x \tan x$ (3mrks)

ii) $\frac{\tan x}{x}$

c) $\int_{\frac{1}{2}}^1 (60t - 16t^2) dt$ (3mrks)

d) Given that $y=3x^2 + 2x-6$, What is the equation of the normal to the curve whose equation is given at point R where $x=1$ (4mrks)

e) Using the substitution $t = \tan \frac{1}{2}x$ find the integral of $1/1 + \cos x$ (4marks)