TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSISCS

CERTIFICATE IN UPGRADING MATHEMATICS

AMA 1003: CALCULUS

END OF SEMESTER EXAMINATION
SERIES: DECEMEBER 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*

This paper consist of **FIVE** questions

Answer question **ONE (COMPULSORY)** and any other **TWO** questions

Maximum marks for each part of a question are as shown

This paper consists of **THREE** printed pages

Question One (Compulsory)

a) (i) A straight line pass trough point A(-3, 2) and B(2, 12). Determine the equation of the line. **(3 marks)**

(ii) One straight line passes through A(3, 2) and B(6, 8) another straight line passes through C (2,4) and D (4, 2). Determine the point of intersection of the two lines **(4 marks)**

b) Determine, numerically:

(i) $\lim_{x\to 2} \frac{x^2+4x+4}{x+2}$ **(3 marks)**

(ii) $\lim_{x\to +\infty} \frac{2x+2}{x}$ **(3 marks)**

c) Determine the domain of $f(x)$ if:

(i) $f(x)=3x^2-9$ **(1 mark)**

(ii) $f(x)=\frac{3x}{x^2-25}$ **(2 marks)**

d) Given $f(x)=2x+2$ and $g(x)=x^2+1$ determine gof **(2 marks)**

e) The revenue R1 of a firm is given by, $R=120x-\frac{x^2}{500}$ determine the instantaneous revenue at x = 2500 units = no of units (sold) **(3 marks)**

f) Determine the f(i) if $f'(1)=2\frac{x_2+2x}{x^2+3x}$ **(3 marks)**

g) Determine the derivative, f'(x) from first principles if $f(x)=2x^2+4$ **93 marks)**

Question Two

a) If $f(x)=\begin{cases} 6x & if\ 0\le x<2 \\ 10 & if\quad x=2 \\ 3x+6 & if\ \ 2<x\le 3 \end{cases}$ is the function differentiable at x = 2 **(4 marks)**

b) Determine the equation of a tangent to the curve $y=x^3+2x$ at x= 2 **(4 marks)**

c) Differentiate $f(x)$ if (i) $f(x) = 3x.\sin x$ **(2 marks)**

(ii) $f(x) = e^{3x2}$ **(3 marks)**

d) (i) Identify all the turns point for the curve **(3 marks)**
$Y = x^3 - 6x^2 + 9x + 30$

(ii) Which of the points is the graph having a maximum value? **(2 marks)**
(iii) What is the maximum value of Y **(2 Marks)**

Question Three

a) The revenue R = x (350 – x) of a firm is the number of units and sold. Required:
(i) The Marginal revenue function **(2 marks)**
(ii) The revenue maximizing units (x) **(2 marks)**
(iii) The maximum revenue **(2 marks)**

b) (i) Determine the domain of the function $x^2 - y^2 = 36$

(ii) $h(x) = -x + 3$ and $g(x) = 4x + 4$ determine (hog) (2) **(5 marks)**

c) Sketch the graph of $f(x) = x^2 - 3x + 2$ **(4 marks)**

Question Four

a) Determine $\lim\limits_{x \to +\infty} 1 - e^{-04x}$ **(3 marks)**

b) The change in revenue with respect to change in units produced $\frac{dc}{dx}$ of a firm is:
$\frac{dR}{dx} = 50x - x^2$

(i) Determine the total revenue function **(4 marks)**
(ii) Sketch the revenue curve **(4 marks)**

c) Evaluate $\int_0^1 (x + 1)^3 dx$ **(4 marks)**

d) Evaluate $f'(1)$ if $f(x) = (x^2 + 4x)^4$ by method of substitution **(5 marks)**

Question Five

a) The gradient function of a curve is $\frac{dy}{dx} = 2x + 3$ determine the equation of if the curve Given it passes through point A (2, 10) **(4 marks)**

b) (i) Use the trapezium rule, with 5 ordinates to evaluate:

$$\int_0^1 2x^2 \, dx$$

(6 marks)

(ii) Determine the error in using the trapezium rule **(4 marks)**

c) Use first principles to evaluate f'(2) if f(x) = $x^2 + 3$ **(6 marks)**