MURANG'A UNIVERSITY COLLEGE

(*A Constituent College of Jomo Kenyatta University of Agriculture & Technology*)

University Examination

School of Pure And Applied Sciences

End of Semester Examination Bridging Certificate In Mathematics

SMB 0103: CALCULUS

DATE: 20th MAY 2015 TIME: 2Hours

INSTRUCTIONS: Answer Question One and Any Other Two Questions

QUESTION ONE (30mks Compulsory)

a) Use the first principles to find the derivative of **$y = x^4$** (5mks)

b) Evaluate $\frac{dy}{dx}$ given that $y = \frac{sinx}{cosx}$ (6mks)

(c) A particle moves on straight line with velocity **$v = 9t^2 - 20t$.** Determine an expression for the accelerate in terms of t. give the distance covered by the particle over the times when **t = 6 and t = 3** (4mks)

d) Find the equation of the normal to the curve described by the equation

$y = x^4 - 3x^2 + 2x$ at the point where **x = 2** (4mks)

e) Evaluate

i) $\int_1^2 \left(x + \frac{1}{x^2}\right) dx$

ii) $\frac{dy}{dx}$, given that $y = (x^2-1)\sqrt{x}$

(f) Find the area bounded by the curve $y = 4x^3 + 1$ between x = 2 and x = 4 using the trapezium rule with intervals of 0.5 of a unit. Also compute the same area using the method of direct integration and find the percentage error in using trapezium rule instead of the integration method (5mmk

QUESTION TWO (20MKS)

(a) Evaluate the following

i) $\int_1^5 (x+4)^2 dx$ (4mks)

ii) $\frac{dy}{dx}$ given that $y = \frac{(x^2+8x)}{(x+1)}$

iii) $\int(2+x)dx$

(b) A rectangular block, with a square base of side x mm , has a total surface area of 150 mm^2. Show that the volume of the block is given by;

$$\mathbf{V = \frac{1}{2}(75x - x^3)mm^3}$$

and hence find the maximum volume of the block. (10mks)

QUESTION THREE (20MKS)

(a) find the turning points of $\mathbf{y = 2x^3 - \frac{1}{2}x^2 - x + 4}$. Distinguish between them and the value of at each turning point. (10mks)

(b) An object moves along a straight line in such a way that its distance from a fixed-point 0 on the line after t seconds is S meters, where $S = \frac{1}{6}t^4$ find;

I) Its velocity after 3 seconds and after 4 seconds (2mks)
II) Its average velocity during the 4^{th} second (3mks)
III) It acceleration after 2 seconds and after 4 seconds (2mks)
IV) Its average acceleration from t = 0 to t = 4 (3mks)

QUESTION FOUR (20 MKS)

(a) Approximate the area under the curve described by the equation $y = x^3 + 9$ and the x – axis from the points where x = 1 up to where x = 6 using the Simpson's rule with ten strips.

(10 Mks)

(b) Approximate the area enclosed by the curve ; $\mathbf{y = x^3 - 2x^2 - 8x}$ and the x-axis

(10mks)