MURANG'A UNIVERSITY COLLEGE

(A Constituent College of Jomo Kenyatta University of Agriculture and Technology)
University Examination
School of Engineering and Technology
End of Second Semester Examination for the diploma of
Building Construction - Year TWO
SEB 1231: ENGINEERING MATHEMATICS III.
DATE: 7TH DECEMBER 2015 2 Hours

INSTRUCTIONS: Attempt Question **One** and any other **Two** Questions.

Question One (30 Marks)

a) If $y = 6x^2 + 2x - 4$ find **(5mks)**

i. $\frac{dy}{dx}$

ii. *Find* $\frac{dy}{dx}$ *using first principal*

b) Differentiate the following

(i) $y = (5x - 2)^{\frac{-5}{2}}$ **(5 Marks)**

(ii) $y = 3sin(6x - 2).$ **(5 Marks)**

(iii) $\boldsymbol{y = \frac{ln(x+1)}{cos(5x)}}$ **(5mks)**

(c) Find the inflexion point of the function $y = f(x) = 3x^3 - 36x^2 + 15.$ **(5 Marks)**

(d) Use chain rule to find $\frac{dy}{dx}$ of y=sinh $(6x^3)$ **(5 Marks)**

Question Two (20 Marks)

a) Use implicit differentiation to find $\frac{dy}{dx}$

(i) $y^2 = (1 - x) + 4x^2.$ **(5 Marks)**

(ii) $x^2 + y^2 + 2xy = 7.$ **(5 Marks)**

(b) Find the relative maximum and minimum values of x of the functions

(i) $f(x) = x^3 - 3x^2 - 9x + 5$ **(5 Marks)**

(ii) $f(x) = (9x - 3)\cdot(x + 1)$ **(5 Marks)**

QUESTION THREE (20 Marks)

(a) A car is travelling such that its distance, *s*(*m*), from its startingposition after time *t*(*s*) is

$$s = \frac{1}{15}t^3 + 2t, \qquad 0 < t < 10$$

$$s = 22(t^2 - 10) + 86.67, \qquad t \geq 10:$$

(i) Give the velocity as a function of time. **(5 Marks)**

(ii) What is the instantaneous velocity when *t* = 5? **(3 Marks)**

(iii) What is the instantaneous velocity when *t* = 15? **(2 Marks)**

(b) Find $\frac{dy}{dx}$when

(i) $y = (3x^2 + 10)(x + 12),$ **(5 Marks)**

(ii) $y = \frac{\sqrt{2x+3}}{x+1}$ **(5 Marks)**

QUESTION FOUR (20 Marks)

(a) (i) Find two integers whose sum is 20 and whose product is a maximum **(5Marks)**

(ii) A farmer wishes to enclose a rectangular plot for a pasture, usinga wire fence on three sides and a hedge row as the fourth side.If he has 2400 ft of wiring what is the greatest area he can fenceoff? **(5 Marks)**

(b) Find $\frac{dy}{dx}$ given

(i) $y = f(x) = x^3 + 4x^{\frac{1}{2}} - 5$ **(4 Marks)**

(ii) $y = f(x) = x^2 - \sqrt{x-3}$ **(4 Marks)**

(iii) $y = f(x) = 2x^3 - 5x^4 + x$ **(2 Marks)**

QUESTION FIVE (20 Marks)

(a) A page is to contain 54 square inches of printed material. If themargins are 1 inch at top and bottom and 1.5 inches at the sides,find the most economical dimensions of the page. **(5 Marks)**

(b) Find the approximate velocities of a particle moving alongthe *x* axis in accordance with the law $s = t^4 - t^2$, from the time *t*= 1.5 and *t* = 2.0. **(5 Marks)**

(c) find $\frac{dx}{dt}$ of the following

(i) $x = 7t^4 - \sqrt[3]{t+1}$, **(5 Marks)**

(ii) $x = 2t^3 + e^{2t} - 2\sin t$. **(5 Marks)**