TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Engineering & Technology

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

CERTIFICATE IN BUILDING & CIVIL ENGINEERING

AMA 1303: ENGINEERING MATHEMATICS III

END OF SEMESTER EXAMINATION
SERIES: APRIL 2013
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Answer Booklet*

This paper consists of **FIVE** questions.
Answer any **THREE** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One

$$y = \frac{2x^3}{3} - 5x^2 + 12x - 7$$

Determine the turning points for the curve . Hence sketch the graph of the curve. **(20 marks)**

Question Two

a) If $P = Q^2 + 2QR + R^3$ find:

(i) $\dfrac{\partial P}{\partial Q}$ (ii) $\dfrac{\partial P}{\partial R}$ (iii) $\dfrac{\partial^2 P}{\partial Q^2}$ (iv) $\dfrac{\partial^2 P}{\partial R^2}$ (v) $\dfrac{\partial^2 P}{\partial Q \partial R}$ (iv) $\dfrac{\partial^2 p}{\partial R \partial Q}$

(10 marks)

b) The time t of swing T of a pendulum is given by $T = \sqrt{L}$ where K is a constant. Determine the percentage change in the time of swing, when the length, L of the pendulum changes from 35.1 to 35 metres. **(10 marks)**

Question Three

a) The distance x metres moved by a car in time t second is given by $x = 6t^3 - 4t^2 + 4t - 1$. Determine:

   (i) The velocity at t = 0, t = 1.5
   (ii) The acceleration at t = 0, t = 1.5   **(7 marks)**

b) Determine the turning point of curve $y = x^3 - 3x + 5$ **(5 marks)**

c) A function is given as $y = \dfrac{x^3}{5}$ find the equation for the following at the point $\left(-1, -\tfrac{1}{5}\right)$
   (i) The tangent to the curve
   (ii) The normal to the curve   **(8 marks)**

Question Four

a) Differentiate from the first principle $y = 4x^2 + 5x - 3$ and determine the gradient of the curve at x = -3

(8 marks)

b) Find $\dfrac{dA}{dB}$ when:

(i) $A = 3B^2 \sin B$

(ii) $A = 3\sqrt{B}.\ \ln 2B$

(iii) $A = 5B^3 + 3B - \dfrac{1}{2B^3} + \dfrac{1}{\sqrt{B}} - 3$

(12 marks)

Question Five

a) Find the derivative $y = \cos ec\ \ ax$

(7 marks)

b) Find $\dfrac{dy}{dx}$ when

i) $y = \dfrac{2xe}{\sin x}$

ii) $y = \dfrac{\ln 2x}{\sqrt{t}}$

iii) $y = \dfrac{2\cos 3x}{x^3}$

(13 marks)