MACHAKOS UNIVERSITY

University Examinations 2016/2017

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

DIPLOMA IN ELECTRICAL AND ELECTRONICS ENGINEERING

DIPLOMA IN BUILDING AND CIVIL ENGINEERING

DIPLOMA IN MECHANICAL ENGINEERING

SUPPLEMENTARY EXAMINATION

CALCULUS 1

DATE: 31/8/2017   **TIME: 8:30 – 10:30 AM**

INSTRUCTIONS

Answer question **ONE** and any other **TWO** questions

1.   (a)   Differentiate the following with respect to x

   i) $y = \dfrac{x^4 + 3x^3 - 4}{x^2}$ (3mks)

   ii) $y = (x^2 + 1)(x^3 - 2)$ (3 marks)

   iii) $y = x^2 \cos 2x$ (4 marks)

   (b)   Evaluate $\dfrac{dy}{dx}$ given that

   i) $e^{xy} = x^3 + y$

   ii) $y = x^4 e^{3x}$

   iii) $y = \dfrac{\sin 2x}{x^2}$ (10 marks)

(c)   A 2% error is made in measuring the radius of a sphere. Determine the

percentage error in the surface area.   (5 marks)

(d)   Given that x = 3t+ 1 and y = 3t(t-2), determine the value of $\frac{dy}{dx}$

when t = 3   (5 marks)

2.   (a)   Investigate the turning points of the function y = $x^3 + 3x^2 + 3x + 2$ and state

the Nature of each turning point   (8 marks)

(b)   Determine the gradient of the curve

$x^2 + 2xy - 2y^2 + x = 2$ at the point (-4, 1)   (7 marks)

(c)   Determine $\frac{dy}{dx}$ given that $y = \frac{e^{5x}cosx}{x^3+4}$ (5 marks)

3.   (a)   Determine the gradient of the following functions at the given points

i) $y = (2x^2 + x + 1)(x^2 + 2)$ at (0,2)   (3 marks)

ii) $y = (3x^2 + 4)^2(x + 4)$ at (0,64)   (4 marks)

(b)   Evaluate $\frac{dy}{dx}$ and $\frac{d^2y}{dx}$ given

(i) $y = x^5 - sin2x + 3$ (3 marks)

(ii) $y = \frac{x^3+4x}{5x}$ (5 marks)

(c)   Differentiate w.r.t x , the function y = sec3xtan2x   (5 marks)

4.   (a)   Determine the differential coefficients of the following functions

(i)   f (x) = $e^{\sqrt{x}}$

(ii) $f(x) = sinx + In\ cosx$

(iii) $f(x) = 3cos2x + 2e^{5x}$ (8 marks)

(b)   Given that $y = 4x^3 - 3x^2 - 36x + 2y + 11$ and that $\frac{dy}{dx} = 0$

Determine the values of x and y (8 marks)

(c) Determine $\frac{dy}{dx}$ given $y = \frac{1}{\sqrt{(3x+1)}}$ (4 marks)

5.   (a) Determine the gradient function using first principles given

that $y = \frac{5}{x^3}$ (8 marks)

(b)   Determine the differential coefficient given that $y = In\ (x^3 + 1)^5$ (4 marks)

(c)   Given the parametric equations; $y = 3\ \sin\theta -\sin^3\theta$ and $x = \cos^3\theta$,

determine $\frac{dy}{dx}$ in terms of θ.   (8 marks)