MURANG'A UNIVERSITY COLLEGE

A Constituent College of Jomo Kenyatta University of Agriculture and Technology

School of Pure and Applied Science

SUPPLIMENTALLY/ SPECIAL EXAMINATION

ELECTRICAL DEPARTMENT

SEE 1102, ENGINEERING MATHEMATICS II

DATE: 19th April 2016 TIME 2HOURS

Instructions: Answer question **one** and any other **two**

1. (a) Differentiate $y= 2x^2 + 3$ using the first principles w.r.t. x. (3mks)
   (b) Find the equations of the normals to the curve $y= x^2 + 3x -2$ where the curve cuts y-axis. (6mks)
   (c) A farmer has an adjustable electric fence that is 200M long. He uses this fence to enclose a rectangular grazing area on three sides, the fourth side being a fixed hedge. Find a maximum area he can enclose. (4mks)
   (d) Find $\int x^4 Inx\ dx$ (4mks)
   (e) Differentiate $\frac{e^x}{\sin x}$ w.r.t. x. (3mks)
   (f) Find the scalar product of **i + j+ k** an **i + j -k** (5mks)
   (g) Integrate $(2x - 1)^2$ w.r.t. x. (3mks)
   (h) If z = f(u, v, w) and $z= 3u^2 -2v + 4w^3v^2$ find the total differential dz. (4mks)

2(a) Find the stationary values of $x^2(3 + 2x - 3x^2)$ and investigate their nature. 6mks

(b) Find derivative of sin x In x w.r.t. x. (3mks)

(c) Differentiate $y = x^x$ w.r.t. x (4mks)

(d) Find $\int cosx\ sin^3x\ dx$ (3mks)

(e) Calculate the work done by a force $\boldsymbol{F}$ = (−5$\boldsymbol{i}$+$\boldsymbol{j}$ +7$\boldsymbol{k}$) N when its point of application moves from point (−2$\boldsymbol{i}$−6$\boldsymbol{j}$ +$\boldsymbol{k}$) m to the point ($\boldsymbol{i}$−$\boldsymbol{j}$ +10$\boldsymbol{k}$) m. (4mks)

3(a) Find the equation of the tangent to the curve $3x^2-7y^2 + 4xy – 8x = 0$ at the point (-1,1) on the curve. (5mks)

(b) Find $\int \frac{Inx}{x}$ (3mks)

(c) Find $\int x^2 \sin x\ dx$ (7mks)

(d) Differentiate $x^2 + y^2 = 4$ w.r.t x (1mks)

(e) Find angle the between vectors –**i + 2j + -k** and **i – j + k** (5mks)

4. (a) Find the value of k for which y = 2x + k is a normal to $y = 2x^2 -3$ (5mks)

(b) Find the maximum displacement of a particle from a fixed point O, if its displacement s meters from O after time t seconds is given by $s = 2+ 3t –t^2$. (4mks)

(c) If $y = 3^x$ find $\frac{d^2y}{dx^2}$ when x = -1 (4mks)

(d) Find the turning points on the curve whose parametric equations are;

$$\begin{cases} x = t \\ y = t^3 - 3t \end{cases}$$ (7mks)

5. (a) pressure P of mass of a gas is given by PV= mRT where m and R are constants, V is the volume and T the temperature, find the partial derivatives $\frac{dp}{dt}$ and $\frac{dp}{dr}$ (3mks)

(b) Find the derivative of 2In(x$\sqrt{x^2-1}$) (4mks)

(c) Find $\int x^2 e^x dx$ (4mks)

(d) Find $\frac{d}{dx}\frac{\sqrt{x-1}}{x}$ (3mks)

(e) If three corners A, B and C of a crystal are known to be at points (3, 2, 1), (4, 0, 2) and (5, 2, 4) respectively find the angle between vector **AB** and **AC** (6mks)