THE MOMBASA POLYTECHNIC UNIVERSITY COLLEGE

((A Constituent College of JKUAT)

(A Centre of Excellence)

Faculty of Engineering &Technology in Conjunction with Kenya Institute of Highways and Building & Technology (KIHBT)

DEPARTMENT OF BUILDING & CIVIL ENGINEERING

HIGHER DIPLOMA IN BUILDING & CIVIL ENGINEERING

EBE 3101: MATHEMATICS

END OF SEMESTER EXAMINATION
SERIES: AUGUST 2012
TIME: 2 HOURS

Instructions to Candidates:

You should have the following for this examination

- *Answer Booklet*
- *Mathematical Table/Calculator*

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 (20 Marks)

a) Write the following in $x+iy$ form:

i) e^{3-3i}

ii) $e^{i\pi/3}$ **(12 marks)**

b) (i) Simplify, $(2-i)(3+4i)$

(ii) Simplify, $3/(1-2i)$ **(4 marks)**

c) (i) Express $z = 2.5 + 4.335$ in the form, $z = re^{j\theta}$ **(5 marks)**

(ii) Use De Moiure's theorem to determine $(1+\sqrt{2i})^6$ **(6 marks)**

Question Two (20 marks)

a) Evaluate, $(2+i)(3-2i)$ **(2 marks)**

b) From $(2+i)(3-2i)$, find:

i) Draw Argand diagram

ii) Argument **(5 marks)**

c) Given $f(x,y) = e^{2x}(x+y)^2$, determine:

i) $\partial f / \partial y$

ii) $\partial f / \partial x$ **(5 marks)**

d) Given $f(x,y) = (xy)^3 - x^2$, determine:

$$\frac{\partial^2 f}{\partial x \partial y} - \frac{\partial^2 f}{\partial x^2}$$

(8 marks)

Question Three (20 marks)

a) If $z(x+y)=\left(x^2+y^2\right)$ show that $\left(\partial z/\partial x-\partial z/\partial y\right)^2$ $=4\left(1-\partial z/\partial x-\partial z/\partial y\right)$ **(8 marks)**

b) If $V=LWH,$ find change in V_1 if L is increased by 0.1% W is decreased by 0.5% and H is increased by 0.05% **(12 marks)**

Question Four (20 marks)

a) Evaluate, $dy/dx,$ given $y=\tan^{-1}e^{3x}$ **(6 marks)**

b) Find dy/dx, given:

i) $y=\left(1-1/x\right)^{1/4}$

ii) $y=\sec\sqrt[3]{x}$

iii) $y=\left(3-7x\right)/\sin x$

iv) $y=\arctan x^3$ **(12 marks)**

c) Find $dy/dx,$ given $y=\sin t,\ t=e^{\cos x}$ **(2 marks)**

Question Five (20 marks)

a) Find $dy/dx,$ when $t=3,$ given $x=t^3,\ y=1/3\,t^3-2t$ **(4 marks)**

b) Given $z=\left(4x^3-2y\right)\left(2x+3y\right),$ find:

i) $\partial z/\partial y$

ii) $\partial z/\partial x$ **(8 marks)**

c) Find $dy/dx,$ given:

i) $y=\tan x\ln\left(\sin x\right)$

$y = \cos e^{\sin t}$

ii) **(6 marks)**

$$y = x^3 - \frac{1}{2}$$

d) Find the equation of the tangent line to the graph at (2,4) **(2 marks)**