TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR:

BACHALOR OF MATHEMATICS AND COMPUTER SCIENCE

SMA4318: COMPLEX ANALYSIS 1

END OF SEMESTER EXAMINATION

SERIES:APRIL2016

TIME:2HOURS

DATE: May2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

(a) Evaluate $\lim_{z\to\infty} \frac{2z^2+4z+5}{5z+z-5}$ (3mrks)

(b) If a = 6-3i and b = 2 – i ,Evaluate $\frac{a+b}{a}$(3mrks)

(c) Find the conjugate of the complex number $z = \frac{1}{2-3i}$ (3mrks)

(d) Evaluate $\lim_{z\to 3+4i} (\frac{4+z^2}{z})$ (3mrks)

(e) If f(z) = $(z^3 + 4z)^2$ find the derivative of f(z) (4mrks)

(f) show that u (x,y) = $2x - x^3 + 3xy^2$ is harmonic (4mrks)

(g) prove that sec(z) = $\frac{z}{e^{iz}+e^{-iz}}$ (4mrks)

(h) Find all the singular points of the function $f(z) = \frac{i+z^3}{2-3z+z^2}$ (4mrks)

(i) Describe the domain of the function $f(z) = \frac{z}{e^z-1}$(2mrks)

Question TWO

(a) Show that the function $f(z)=\frac{-1}{(z-1)\,(z-2)}$ is analytic in the domain D_1, : 1z1 < 2 and D_2, : 1≤1z1 < 2(6mrks)

(b) Evaluate $\int \frac{1}{4+z^2}$ dz where c: |z-i|=2 (7mrks)

(c) Find the Taylor series for the function $f(Z) = e^{2z}$ (7mrk

Question THREE

(a) Solve for z in $e^z = -1$ (5mrks)

(b) Prove that sin (iy)= isinh(y) (5mrks)

(c) Show that log $(1+i)^2$ = 2log (1+i) (5mrks)

(d) Evaluate $(-i)^i$ (5mrks)

Question FOUR

(a) If z= 2+5i find$z^{\frac{1}{4}}$ the fourth roots of z (7mrks)

(b) Illustrate the following transformation $f(z) = z^2$ for the line x=1 (7mrks)

c) Show that $f(z) = \frac{z}{\bar{z}}$ is not continuous on the entire Z-plane (3mrks)

d) Evaluate $2i^i$ (3mrks)

Question FIVE

(a) Find the derivative of $f(z) = z^2$ by Cauchy theorem (6mrks)

(b) Show that the function $f(z) = 3x + y + (3y - x)i$ is entire (4mrks)

(c) Find the Harmonic conjugate of the function u(x,y) =e^ysin(x)
Hence find the function $f(x, y) = u + iv$ (6mrks)

(d) Show that the function in $f(z) = \frac{2z+4}{5z}$ is continuous at z=2 (4mrks)