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: APRIL 2016

TIME: 2 HOURS

DATE: May 2016

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.

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Question ONE

(a) If z_1=3-4i and z_2== 2+3i evaluate

(i) $\overline{z_1 z_2}$ (4mrks)

(ii)   arg (z_2) (2mrks)

(b) Find the cuberoot of the complex number z= 4+4i   (4mrks)

(c) Express the equation of the function f(z)=z^2 in polar form   (4mrks)

(d) Evaluate $\lim\limits_{z\to\infty} \dfrac{2z+1}{z+1}$ (4mrks)

(e) If f (z) =$\dfrac{z^2-1}{2z+1}$, Evaluate the derivative of f(z)   (4mrks)

(f) Show that sin(z)= $\dfrac{e^{iz}-e^{-iz}}{2i}$ (4mrks)

h) Determine the singular points of the function $f(z) = \frac{2z+1}{(z^2-1)z}$ (4mrks)

Question TWO

(a) Find the Laurent series of the function $f(z) = e^z$ (8mrks)

(b) Find the residues of the function $f(z) = \frac{z+1}{z^2(z^2+1)}$ in c where c:$|z| \le 1$ (7mrks)

c) If z_0 is any interior to the positive orientation of a simple close contour C and $f(z)=1$ find $\int_c \frac{f(z)}{z-z_0} dz$

(5mrks)

Question THREE

(a) Solve the equation $e^z = -2$ (5mrks)

(b) Prove that $\ln z = \ln r + i\emptyset$ (5mrks)

(c) Evaluate the differentiation of the function $f(z) = (z^2 + 3z)(\cos z)^2$ (5mrks)

(d) Evaluate $\int_0^{\frac{\pi}{4}} e^{it} dt$ (5mrks)

Question FOUR

(a) Represent graphically the conformal mapping $f(z) = Z^2$ for the line y =1 (6 mrks)

(b) Show that the function $f(z) = \frac{z^2+4z}{z+4}$ is continuous at z=1 (3mrks)

(c) Show that the function $f(z) = \bar{z}$ does not satisfies Cauchy riemann theorem (4mrks)

(d) Show that the faction $T(x,y) = e^{-y} \sin x$ is harmonic (4mrks)

(e) Evaluate 2^i (3mrks)

Question FIVE

(a) Use the cauchy theorem to find dw/dz given that $w = e^x (\cos y + i\sin y)$ (8mrks)

(b) Find the harmonic conjugate of a harmonic function $u(x,y) = y^3 - 3x^2 y$ hence find

f(x,y)   (8mrks)

(c) If $z = 2+4i$ find $|\bar{z}|$ hence find the argument of z   (2mrks)