KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS

COURSE CODE: MATH 313

COURSE TITLE: COMPLEX ANALYSIS

STREAM: Y3S1

DAY: TUESDAY

TIME: 2.00 – 4.00 P.M.

DATE: 15/03/2011

INSTRUCTIONS:

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

PLEASE TURN OVER

QUESTION ONE

   (a) Find the value of a and b if

$$\underline{\quad\quad} = 1 - 2 \qquad\qquad\qquad\qquad\qquad \textbf{(3 marks)}$$

   (b) Show that $|\;\;| = |\overline{\;\;}|$ for all   **(3 marks)**

   (c) Given that $= 2 + 3$

       Determine;

            (i) $|\;\;|$ (ii) <u>Arg</u>   **(4 marks)**

   (d) Using first principle derive cosz   (8mks

   (e) Determine if the function   is analytic   **(7 marks)**

   (f) Prove that   **sin**   is analytic

QUESTION TWO

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   (a) Evaluate;

$$\oint \frac{\underline{\qquad\qquad}}{(\qquad\qquad)} \qquad\qquad\qquad\qquad \textbf{(10 marks)}$$

   (c) Derive the Cauchy – Riemann conditions for analytic functions and laplace equations.
                                                 (10 marks)

QUESTION THREE

   (a) State Canchy's integral formula.   **(2 marks)**

   (b) Show that if $(\;)$ is analytic inside and on a simple closed curve c and a is any point

       inside C then $(\;) = \dfrac{1}{2\pi} \oint \dfrac{(\;)}{(Z - \;)^2}$ **(10 marks)**

   (c) Find the value of the integral $\oint \underline{\qquad}$ around the unit circle with centre at

       (i) $= 1$ (ii) $= -1$ **(8 marks)**

QUESTION FOUR

(a) Expand $f(\ ) = \dfrac{}{(\ \ )(\ \ )}$ in the region

   (i) $|\ | < 1$ **(5 marks)**

   (ii) $|\ | > 2$ **(5 marks)**

b(i)(Evaluate $\displaystyle\int_{\infty}^{\infty} \dfrac{}{(\ \ )\,(\ \ )}$ (10 marks)

(ii) $\displaystyle\int \dfrac{}{(\ \ \ )}$

QUESTION FIVE

(a) Use the first principle technique to find the derivative of the following complex functions

        (i) $f(\ ) = \sin$ **(4 marks)**

        (ii) $f(\ ) =$ **(4 marks)**

(b) Briefly explain the meaning of the following terms:

   (i) Singularity   **(2 marks)**

   (ii) Removable singularity   **(2 marks)**

(c) Express $\tan 4\theta$ in terms of $\tan \theta$ only using powers of complex numbers. **(4 marks)**

(d) If $f(\ ) = \dfrac{}{(\ \ )(\ \ )}$, determine the poles and residues for $f(\ )$.   **(4 marks)**