中 山 大 学 软 件 学 院 **2010** 级 软 件 工 程 专 业 (2012 春季学期)

《工程数学》期末试题试卷(A)

(考 试 形 式： 闭 卷 考 试 时 间：2 小 时)

警 示

《中山大学授予学士学位工作细则》第六条

考 试 作 弊 不 授 予 学 士 学 位

方向：____________ 姓名：________ 学号：________

出卷：________________ 审核：______________

注意：答案一定要写在答卷中，写在本试题卷中不给分。本试卷要和答卷一起交回。

1. Find the value(s) of (10 points)

(a) $(-8i)^{1/3}$ (b) $|e^{i\alpha}\dfrac{3-2i}{2+3i}|, \alpha \in R$

2. Show that *f(z)=u(x,y)+iv(x,y)* and that *f'(z)* exists at a point $z_0=x_0+iy_0$. Then the first-order partial derivatives of *u* and *v* must exist at (x_0,y_0), and they must satisfy the Cauchy-Riemann equations (10 Points)

$$u_x = v_y, u_y = -v_x$$

3. Show that

(a) $Log(1+i)^2 = 2Log(1+i)$ (b) $Log(-1+i)^2 \neq 2Log(-1+i)$ (10 Points)

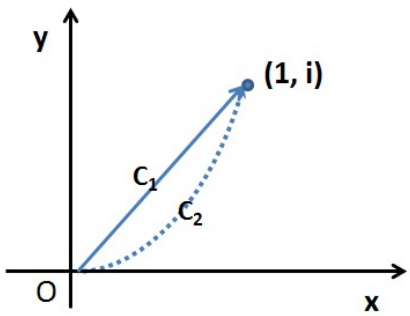
4. Suppose $f(z) = x^2 + iy$,

(a) Determine whether *f(z)* is analytic or not in the xy-plane

(b) Evaluate the integral $\int_C f(z)dz$, where C is

(b1) the line from 0 to (1,i)

(b2) the curve $y=x^2$ from 0 to (1,i) (15 points)



5. Expand the function

$$f(z)=\frac{1+2z^2}{z^3+z^5}$$

into a series involving powers of z, and find the residue (10 points)

6. Let C be the counterclockwise circle with center at 0 and radius r. Evaluate the following integrals

$$\oint_C \frac{e^z}{z^2-2z-8}dz$$

where r=1, 3 and 5 (10 points)

7. Evaluate the following improper integrals

(a) $\int_0^{+\infty} \frac{x^2}{x^6+1}dx$

(b) $\int_0^{+\infty} \frac{x\sin x}{x^2+a^2}dx, (a>0)$ (15 points)

8. Find the special case of linear fractional transformation

$$w=\frac{az+b}{cz+d}, (ad-bc\neq 0)$$

that maps the points

(a) $z_1=1$, $z_2=0$, $z_3=i$ onto the point $w_1=(3+i)/5$, $w_2=-i$, $w_3=0$

(b) $z_1=1$, $z_2=0$, $z_3=i$ onto the point $w_1=\infty$, $w_2=2$, $w_3=i$ (10 points)

9. Suppose that $f = u + iv$ is an analytic function, find v given u: (10 points)

$$u(x,y)=x^2-y^2$$