

國立臺灣科技大學  
九十二學年度碩士班招生考試試題

系所組別：電機工程系碩士班甲組、電機工程系碩士班乙二組  
科 目： 工程數學

題目共 2 頁，總共 100 分，各題分數如示。

1. Solve the general solution for the following equation:  $y'' = 1 + (y')^2$   
(10%)

2. Find the Laplace transform of the following function:

$$e^{-2t} \int_0^t e^{-2\tau} \cos(3\tau) d\tau \quad (10\%)$$

3. Find the Fourier transform of the following function:  $\frac{1}{a + jt}$   
(10%)

4. If **A** and **B**, both  $n \times n$ , have the same eigenvalues. Prove or disprove that **A=B**. (10%)

5. For the following quadratic equation, assuming that the number of variables is 3, determine the associated symmetric **A** matrix.

$$x_1^2 - 4x_3^2 + 3x_1x_2. \quad (10\%)$$



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6. If the complex value  $z=1+2i$ , calculate the absolute value of  $w$ , where  $w=e^z+\cos(z)+\cosh(z)$ . (10%)

7. For the complex functions  $f(z)=|z|^3$  and  $g(z)=\cos(z)$ , show and explain in the complex plane where  $f(z)$  and  $g(z)$ , respectively, are analytic or singular. (10%)

8. If  $D$  is the region in the complex plane defined by  $1<|z|<2$ , show the region of  $w$ , which is defined by the conformal mapping  $w=\frac{1}{z+(1+i)}$ . (10%)

9. If the intersection line of two planes is defined by

$$2x-3y+4z=1$$

$$x-y-z=5$$

find the parametric equations for the line. Also find the point  $P$  in the line which is closest to point  $Q(4, 9, 0)$ . (10%)

10. If curve  $C$  is the quarter part of the circle  $x^2+y^2=4^2$  located in the first quadrant of  $x$ - $y$  plane. Give  $F=x$  and  $\vec{G}=y\vec{a}_x+2x\vec{a}_y$ , calculate  $\int_C Fd\ell$  and  $\int_C \vec{G}\cdot d\vec{\ell}$ . (10%)

