大葉大學 95 學年度　研究所碩士班甄試　招生考試試題紙					
系　所　別	組別	考　試　科　目（中文名稱）	考試日期	節次	備　　註
電機工程		工程數學	12月19日	第一節	共乙頁

註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

1. (10%) Find the general solution of the first order differential equation
$$\frac{dy}{dx}-\frac{2}{x}y=x^2\cos 3x.$$

2. (10%) The solution of the second order differential equation $y''-ay'+by=0$ with initial condition $y(0)=1$ and $y'(0)=3$ is $y(t)=Ae^{-t}\cos 2t+Be^{-t}\sin 2t$ where a, b, A, B are constants. Find the values of a, b, A, B

3. (12%) Solve the integral-differential equation by the method of Laplace transform
$$y'(x)=1-\int_0^x y(t)e^{-2(x-t)}dt;\ y(0)=1$$

4. (18%) Let H(ω), F(ω), G(ω) be the **Fourier Transform** of h(t), f(t) and g(t) respectively
   (6%) (1) If g(t) is related to f(t) as follows:
   $$g(t)=2f(t)+\frac{1}{2}[f(t-2)+f(t+2)]$$
   What is the relationship between F(ω) and G(ω).
   (12%) (2) If g(t) be the convolution of f(t) and h(t). If $f(t)=e^{i\omega_1 t}+e^{-i\omega_2 t}$, express g(t) in terms of ω_1,ω_2, and H().

5. (12%) Using (a) direct calculation (b) Green's theorem in the plane evaluate
$$\oint_C[(3x^2+y)dx+4y^2dy]$$
   C is the boundary of the triangle with vertices (0,0), (1,0), (0,2) in counterclockwise

6. (10%) $f(x)=2x, g(x)=3+cx, 0\le x\le 1$
   (1) What is the value of c so that f(x) and g(x) are orthogonal?
   (2) What are the normalized functions of f(x) and g(x) respectively?

7. (10%) Solve the eigenvalue problem
$$y''+\lambda y=0,\ y(0)=y(1)=0$$

8. (8%) Find the determinant of the $n\times n$ matrix **B** that has p's on the diagonal and q's elsewhere:
$$\mathbf{B}=\begin{bmatrix} p & q & \cdots & q \\ q & p & \cdots & q \\ \vdots & \vdots & \ddots & \vdots \\ q & q & \cdots & p \end{bmatrix}$$

9. (10%) Let λ and μ be two distinct eigenvalues of a real square matrix **A**, and let **x** and **y** be corresponding eigenvectors of **A**, Show that if in addition, **A** is symmetric, then **x** and **y** are orthogonal