

國立高雄應用科技大學  
100 學年度碩士班招生考試  
電子工程系 (乙組)

准考證號碼  (考生必須填寫)

工程數學

試題 共 2 頁第 1 頁

注意：a. 本試題共分選擇題及填充題兩種。第 1-4 題為選擇題(單選)，每題均為 10 分，第 5-8 題為填充題，其中第 5 題和 6 題每題均為 15 分，第 7 題為 10 分，第 8 題為 20 分，共 100 分。

b. 作答時不必抄題。

c. 考生作答前請詳閱答案卷之考生注意事項。

d. 作答時各題答案需寫題號並且必須依題號順序寫在答案卷；未寫題號而作答者不予計分。

1. Which one is right for the differential equation  $0.1y'' + 11y' + 100y = 40000 \cos 400t$ ?  
(A) It is a homogeneous differential equation. (B) It is a second-degree differential equation. (C) It is a differential equation for an application to RLC-circuit. (D) It is a nonlinear differential equation. (E) It is a partial differential equation.
2. Find the inverse Laplace transform of  $Y(s) = \frac{s^4 + 3(s+1)^3}{s^4(s+1)^3}$ . The answer is (A)  $\frac{1}{2}t^3 + \frac{1}{2}t^2e^{-t}$  (B)  $\frac{1}{2}t^2 + \frac{1}{2}te^{-t}$  (C)  $\frac{1}{2}t^3 + \frac{1}{2}t^2e^t$  (D)  $\frac{1}{2}t^2 + \frac{1}{2}te^t$  (E)  $\frac{1}{2}t^2 + \frac{1}{2}t^{-1}e^{-t}$ .
3. The period function  $f(x) = x^2$  if  $|x| < \pi$  and  $f(x+2\pi) = f(x)$ , then the constant term of Fourier series of  $f(x)$  is (A) 0 (B)  $\frac{1}{3}$  (C)  $\frac{1}{3}\pi$  (D)  $\frac{1}{3}\pi^2$  (E)  $\frac{1}{3}\pi^3$ .
4. If the Fourier transform of  $f(x) = e^{-x^2}$  is  $\frac{1}{\sqrt{2}}e^{-w^2/4}$ . Then the Fourier transform

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of  $f(x) = xe^{-x^2}$  is (A)  $\frac{1}{2\sqrt{2}}e^{-w^2/4}$  (B)  $-\frac{1}{2\sqrt{2}}e^{-w^2/4}$  (C)  $\frac{i}{2\sqrt{2}}e^{-w^2/4}$  (D)

$\frac{iw}{2\sqrt{2}}e^{-w^2/4}$  (E)  $-\frac{iw}{2\sqrt{2}}e^{-w^2/4}$ .

5. Solve the the Laguerre's ordinary differential equation:  $ty'' + (1-t)y' + 3y = 0$ . Then  $y(t) =$  \_\_\_\_\_.

6. Find a general solution of differential equation  $x^2y'' - xy' + y = x \ln|x|$ . Then  $y(t) =$  \_\_\_\_\_.

7. Find the integral  $\int_{-\infty}^{\infty} \frac{dx}{1+x^2}$  by Residue theorem.

Then the answer is \_\_\_\_\_.

8. If matrix  $\mathbf{A} = \begin{bmatrix} 7.3 & 0.2 & -3.7 \\ -11.5 & 1 & 5.5 \\ 17.7 & 1.8 & -9.3 \end{bmatrix}$  and  $\mathbf{X}$  is the matrix with its eigenvectors. Hence

(1) matrix  $\mathbf{X} =$  \_\_\_\_\_.

(2) if matrix  $\mathbf{B} = \mathbf{X}^{-1} \mathbf{A}^3 \mathbf{X}$ , then  $\mathbf{B} =$  \_\_\_\_\_.