

# 元智大學 103 學年度研究所 碩士班 招生試題卷

系(所)別： 電機工程學系碩  
士班

組別： 不分組

科目： 工程數學

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⊗ 不可使用電子計算機

1. Solve  $y' = (2x+1)e^{-x}y^2$  (10%)

2. Solve the following ODE by "coefficients of undetermined". (10%)

$$y'' + 4y' - 2y = 4x^2 - 6x + 12$$

3. Find the inverse Laplace transform of  $F(s)$ . (10%)

$$F(s) = \frac{s^2 + 6s + 9}{(s-1)(s-2)(s+4)}$$

4. Solve the following ODE by Laplace transform. (10%)

$$y'' - 3y' + 2y = e^{-4x}, y(0) = 1, y'(0) = 5$$

5. Given the continuous-time waveform in Fig.1, find its Fourier transform. (10%)

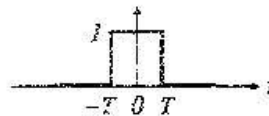


Fig.1

6. Random variables  $X$  and  $Y$  have the joint PMF (Probability Mass Function) (20%)

$$P_{X,Y}(x,y) = \begin{cases} cxy & x=1,2,4; y=1,3, \\ 0 & \text{others} \end{cases}$$

5%(a) What is the value of the constant  $c$ ?

5%(b) What is  $P\{Y < X\}$ ?

5%(c) What is  $P\{Y = X\}$ ?

5%(d) What is  $P\{Y = 3\}$ ?

7. Find the eigenvalues and eigenvectors of the matrix. (10%)

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

8. (a) If  $A$  is a nonsingular matrix, prove that  $A^T A$  is positive definite. (10%)

(b) If  $u$ ,  $v$ , and  $w$  are linear independent vectors, show that  $u$ ,  $u+v$ , and  $u+v+w$  are also linear independent vectors. (10%)

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