

國立臺灣科技大學  
八十八學年度碩士班招生考試試題

系所別：電子工程系碩士班

組別：乙組

科目：工程數學

1. Find the solution of the differential equation

1. (12%) Find the solution of the differential equation

$$y'' + 2y' + 2y = f(t) \quad \text{where } f(t) = \begin{cases} 1 & 0 \leq t < \pi \\ 0 & t \geq \pi \end{cases}$$

2. (12%) Solve  $x^3 y^{(3)} - 2x^2 y'' + x y' - y = 0$  for  $x > 0$ .

3. (12%) Using the Schmidt process, construct a set of orthonormal vectors from the vectors as show.

$$V_1 = [1 \ 1 \ 1]$$

$$V_2 = [1 \ 2 \ 3]$$

$$V_3 = [2 \ 3 \ 1]$$

4. (12%) Suppose that  $A^2 = 4A$ . Show that the eigenvalues of  $A$  is either 0 or 4.5. (12%) Find the tangent plane & normal line to the surface  $z^2 = x^2 + y^2$  at the point  $(1, 1, 1)$ .6. (12%) Assume  $F = [x \ -3 \ 3x]$  &  $S$  is part of  $2x + 3y + z = 1$  for  $y > 0, z > 0$ . Find

$$\iint_S F \cdot \hat{n} \, dS = ? \quad \text{, where } \hat{n} \text{ is the unit normal vector on } S.$$

7. (12%) Find the Fourier series of the following periodic function

$$f(x) = \begin{cases} x^2 & 0 \leq x < 1 \\ 1 & 1 \leq x \leq 4 \end{cases}$$

8. (16%) Compute Fourier Transform of a triangular function defined as

$$f(x) = \begin{cases} 1+x & 0 \leq x \leq 1 \\ 1-x & -1 \leq x \leq 0 \\ 0 & \text{otherwise} \end{cases}$$