

淡江大學 108 學年度碩士班招生考試試題

9-1

系別：機械與機電工程學系
A 組、B 組

科目：工程數學

考試日期：3 月 10 日(星期日) 第 1 節

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1. Solve $y' + y = x$; $y(0) = 7$. (10%)

2. Solve $y'' + 16y = 0$; $y(\frac{\pi}{2}) = 1$, $y'(\frac{\pi}{2}) = -4$. (10%)

3. Solve $y'' + 4y = f(t)$, $y(0) = y'(0) = 0$ by Laplace transform

$$\text{where } f(t) = \begin{cases} 0 & , t < 2 \\ t+1 & , t \geq 2 \end{cases} \quad (10\%)$$

4. Find the eigenvalues and the corresponding eigenvectors of \mathbf{A} :

$$\mathbf{A} = \begin{bmatrix} -1 & 0 & 5 \\ 0 & 1 & 0 \\ 0 & 0 & -2 \end{bmatrix} \quad (10\%)$$

5. Solve

$$\begin{cases} x_1' = x_1 + x_2 + 6e^{2t} \\ x_2' = x_1 + x_2 + 2e^{2t} \end{cases}, \quad \begin{cases} x_1(0) = 6 \\ x_2(0) = 0 \end{cases} \quad (20\%)$$

6. Find the work done by $\vec{F} = 2x\vec{i} - 2y\vec{j} + yz\vec{k}$ and $\vec{R} = t^2\vec{i} - t\vec{j} + 4t\vec{k}$ for $0 \leq t \leq 3$. (10%)

7. Find the Fourier series of the function

$$f(x) = \begin{cases} 4x, & 0 \leq x \leq 2 \\ 0, & -2 \leq x \leq 0 \end{cases} \quad (10\%)$$

8. P.D.E.: $\frac{\partial u}{\partial t} = 16 \frac{\partial^2 u}{\partial x^2}$, $0 < x < 4$, $t > 0$. (20%)

B.C.: $u(0,t) = u(4,t) = 0$, $t > 0$

I.C.: $u(x,0) = 4x$, $0 < x < 4$