

淡江大學九十學年度碩士班招生考試試題

系列：航空太空工程學系

科目：工程數學

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本試題共 / 頁

1. Solve the initial value problem 15%

$$4y'' - 4y' + 65y = 64e^{x/2} + 65x - 4, \quad y(0) = 1 \quad y'(0) = 5.5$$

15%

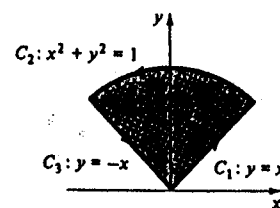
2. Find the inverse (反矩陣) of the matrix 15%

$$\begin{bmatrix} 2 & 4 & 1 \\ 1 & 2 & 1 \\ 3 & 4 & 2 \end{bmatrix}$$

3. Find the work done by the force $\vec{F} = (-16y + \sin x^2)\vec{i} + (4e^y + 3x^2)\vec{j}$

acting along the simple closed curve C shown on the right (find

$$\oint_C \vec{F} \cdot d\vec{r} \text{ on } C). \quad 15\%$$



4. Solve the wave equation 15%

$$u_{tt} = c^2 u_{xx} \quad \text{for } -\infty \leq x \leq \infty, t \geq 0$$

$$u(x,0) = e^{-|x|}, \quad u_t(x,0) = \sin^2 x, \quad \text{for } -\infty \leq x \leq \infty$$

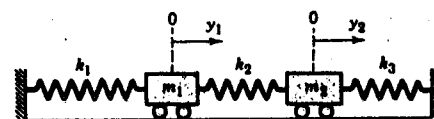
$$c = 3$$

5. (a). Set up the governing equations for the system shown on the right.

10%

(b). Assuming $m_1 = m_2 = 10\text{kg}$, $k_1 = k_3 = 20\text{kg/sec}^2$, $k_2 = 40\text{kg/sec}^2$, $y_1(0) = y_2(0)$, $y_1'(0) = 1\text{meter/sec}$, $y_2'(0) = -1\text{meter/sec}$, solve the system of

equations by the Laplace transformation method. 10%



6. Solve the following problem by the method of separation of variables.

$$u_t = ku_{xx} \quad \text{for } 0 \leq x \leq L, t \geq 0$$

$$u(x,0) = f(x) = \begin{cases} x & \text{for } 0 \leq x \leq L/2 \\ L-x & \text{for } L/2 \leq x \leq L \end{cases} \quad 20\%$$

$$u(0,t) = u(L,t) = 0 \quad \text{for } t \geq 0$$