

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：纖維及高分子工程研究所

組別：丙組

科目：工程數學

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Solve the following differential equations:

(1) $y' - \frac{1}{x}y = x^2 + 2$ (12%)

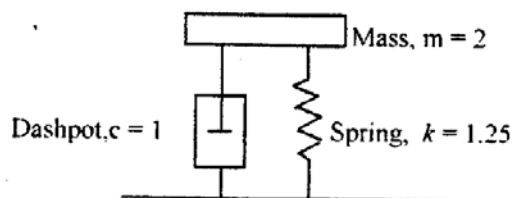
(2) $y''' - y'' - 4y' + 4y = 6e^{-x}$ (12%)

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Find the inverse transform $y(t)$ of the following function $Y(s)$.

$Y(s) = \ln \frac{s+1}{s-1}$ (12%)

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There is a mass-spring-damper system in equilibrium condition. Please derive the position function of the mass after the driving force $F(t) = 3u(t)$ is applied to the mass. (where $u(t)$ is a unit step function)

(14%)



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四、Find the eigenvalues and eigenvectors of the following matrices.

$$(a) \mathbf{A} = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 0 & 1 \\ 4 & -4 & 5 \end{bmatrix} \quad (10\%)$$

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

$$(c) \mathbf{C} = \begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix} \quad (10\%)$$

五、Solve $\frac{\partial w}{\partial x} + 2x \frac{\partial w}{\partial t} = 2x$ with $w(0, t) = 1$; $w(x, 0) = 1$ (10%)

六、Given $f(x, y, z) = 2x^2 - y^2 - z = 0$,

(a) Find the unit normal vector at P: (1, 1, 1) (5%)

(b) Find the tangential plane at P (5%)