


淡江大學九十學年度碩士班招生考試試題

系別：化學工程學系

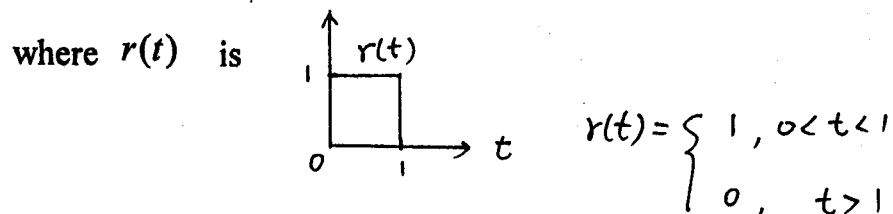
科目：工程數學

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本試題共  頁

1. Solve $x(x-1)y'' + (3x-1)y' + y = 0$ (25%)

2. Solve $y'' + 3y' + 2y = r(t), y(0) = 0, y'(0) = 0$ (25%)



Given:

$$\mathcal{L}\{f''\} = s^2 \mathcal{L}\{f\} - sf(0) - f'(0)$$

$$\text{if } \mathcal{L}\{f(t)\} = F(s), \text{ then } \mathcal{L}\{f(t-a)u(t-a)\} = e^{-as}F(s)$$

$$\mathcal{L}\{e^{at}f(t)\} = F(s-a), \quad \mathcal{L}\{1\} = \frac{1}{s}$$

3. Find the directional derivative of $f(x, y, z) = 2x^2 + 3y^2 + z^2$

at the point $P: (2, 1, 3)$ in the direction of the vector

$$\vec{a} = \vec{i} - 2\vec{k} \quad (10\%)$$

4. Find the Fourier Series of the given function that is assumed

to have period 2, $f(x) = |x|$, $(-1 < x < 1)$ (15%)

5. Solve the following heat equation with the boundary and

initial conditions: (25%)

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}, u(0, t) = U_1, u(L, t) = U_2, u(x, 0) = f(x)$$