

淡江大學 100 學年度碩士班招生考試試題

41

系別：水資源及環境工程學系 科目：工 程 數 學

考試日期：2月28日(星期一) 第3節

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1. The position vector of a moving particle is given by $r(t) = 2\cos(t)i + 2\sin(t)j + 3k$

Find velocity vector $v(t)$ and acceleration vector $a(t)$ at $t = \frac{\pi}{4}$ (20 分)

2. Solve 2nd order differential equation (Initial Value Problem) as below (20 分)

$$y'' - 2y' + y = e^x$$

Initial Conditions: $y(0) = 1, y'(0) = 0$

3. Solve 2nd order differential equation as below (20 分)

$$y'' + 2y' + y = f(t)$$

Where $f(t) = u(t-1) - 2u(t-2) + u(t-3)$, $u(t)$ is unit step function defined as

$u(t-a)=0$, if $t < a$, $u(t-a)=1$ if $t > a$

and Initial Conditions: $y(0) = 0, y'(0) = 0$

4. Solve system differential equations as below:

$$\frac{dx}{dt} = 2x + 3y$$

$$\frac{dy}{dt} = 2x + y \quad (20 \text{ 分})$$

5. Find the half-range expansion of function below in Fourier Series. (20分)

$$f(x) = \frac{2k}{L} \quad \text{if } 0 < x < \frac{L}{2}$$

$$f(x) = \frac{2k}{L}(L-x) \quad \text{if } \frac{L}{2} < x < L$$