

國立臺北科技大學

九十三年年度製造科技研究所入學考試

微分方程試題

填准考證號碼

第一頁 共一頁

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注意事項：

1. 本試題共六題，配分共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在答案卷之答案欄內，否則不予計分。

1. Find $y(t)$ satisfies the following ODE's. @8%x2 = 16%

(a) $(t^2 - 16)y' + t y = 2t, t > 0.$

(b) $(y')^2 - y'(t^{-2} + 3t^2 e^{t^3}) + 3e^{t^3} = 0,$ and $y \rightarrow 0$ as $t \rightarrow \infty.$

2. Let $y(t)$ satisfy $y'' + \epsilon y' + 3y = 4\sin(Bt)$ where ϵ is a small parameter. Since the small ϵ can be neglected temporarily in order to solve the ODE, or it can be simplified as

$$y'' + 3y = 4\sin(Bt) \quad \text{together with initial conditions } y(0) = C \text{ and } y'(0) = 2.$$

In addition, let $y(t)$ can be shown by Fig. 1. The figure shows both the transient and steady-state responses. What is $y(t)$ from the simplified ODE? (4%) And, what are the amplitude of the steady-state A , and variables B , and C ? (@4%x4 = 16%)

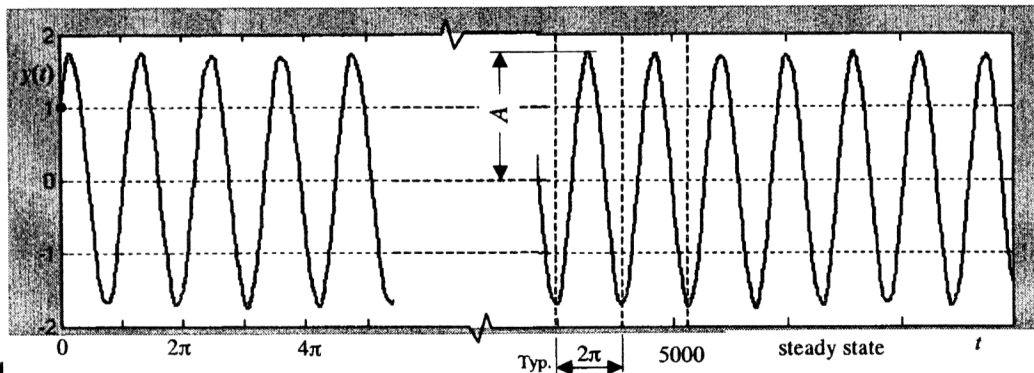


Fig. 1

3. If $y(t)$ satisfies

$$\frac{1}{4}y'' + y' + 17y = 34t \quad \text{with initial conditions } y(0) = 0 \quad \text{and} \quad y'(0) = -2.$$

What is $y(t)$? (12%)

4. Solve the fourth order ODE for $y(t)$

$$y^{(4)} + 4y'' = 16\sin(2t) + 8. \quad (16\%)$$

5. Solve for $x(t)$ and $y(t)$ from ODE

$$\begin{cases} x'(t) = \frac{3}{t}x + \frac{1}{t}y \\ y'(t) = -\frac{5}{t}x - \frac{1}{t}y \end{cases} \quad \text{where } t > 0. \quad (20\%)$$

6. $y'' + 5y' + 6y = f(t)$ with $y(0) = y'(0) = 0$. If $f(t)$ is shown by Fig. 2, find $y(t)$ when $t > 2$. (20%)

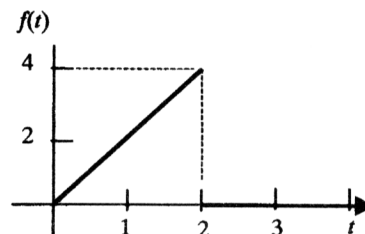


Fig. 2

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