

大葉大學 99 學年度 研究所碩士班 招生考試試題紙

系所別	組別	考試科目 (中文名稱)	考試日期	節次	備註
電機工程學系碩士班	乙組	工程數學(微分方程、Laplace 轉換)	3月21日	第一節	共二頁 08:30~10:00

說明 1: 可否攜帶特殊作答輔助工具: 否 是, 考生可使用 _____ (如未註明, 一律不准攜帶)

Part I. Ordinary differential equation

1. To solve the first order differential equation. (15%)

$$y' = \frac{xe^{(x^2+y^2)}}{y} \text{ where } y' = \frac{dy}{dx} \text{ with a solution } e^{Ax^2} + e^{By^2} = \text{const.}, \text{ please find}$$

A and B.

2. To solve the initial value problem of the first order differential equation. (10%)

$$y' + 5y = 2, y(0) = 10 \text{ where } y' = \frac{dy}{dt}$$

If the solution is of the form $y(t) = Ae^{Bt} + C$, please find A, B, and C.

3. To solve the second order differential equation. (15%)

$$y'' - 3y' + 2y = 0, y(0) = 2, y'(0) = 5, \text{ where } y'' = \frac{d^2y}{dt^2}, y' = \frac{dy}{dt}$$

with a solution $y(t) = Ae^t + Be^{2t}$, please find A and B.

4. To solve the second order differential equation. (15%)

$$y'' - 2y' = e^x \sin x, y(0) = 2, y'(0) = 5/2, \text{ where } y'' = \frac{d^2y}{dx^2}, y' = \frac{dy}{dx}$$

If the solution likes $y(x) = A + Be^{2x} + Ce^x \sin x$, please find A, B, and C.

Part 2. Laplace transform

5. Find the Laplace transform of $f(t) = 4e^{5t} + 6t^3 - 3\sin 4t + 2\cos 2t$, with a solution

$$\frac{A}{s-5} + \frac{B}{s^4} + \frac{C}{s^2+16} + \frac{Ds}{s^2+4}, \text{ please find A, B, C, and D, where the Laplace transform}$$

is defined as $F(s) = \int_0^{\infty} e^{-st} f(t) dt$. (15%)

6. Find the Laplace transform of $f(t) = \sin^3 t$. (Hint: let $\sin t = \frac{e^{it} - e^{-it}}{2i}$)

If the solution is of the form $\frac{A}{s^2+1} + \frac{B}{s^2+9}$, and find A, and B. (15%)

7. Use Laplace transform to solve $y'' - 3y' + 2y = 4e^{2t}, y(0) = -3, y'(0) = 5$, and it has a

solution $y(t) = Ae^t + Be^{2t} + Cte^{2t}$. Please find A, B, and C. (15%)