

國立臺北科技大學九十四學年度學士班轉學考試

機械系 工程數學試題

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 4 題，共 100 分。
2. 請按順序標明題號作答，不必抄題。
3. 全部答案均須答在試卷答案欄內，否則不予計分。

Problem 1. (25%)

Please solve the following ordinary differential equation

$$y'' + y = \tan x$$

Problem 2. (25%)

Please solve the following ordinary differential equation

$$x^3 \frac{d^3 y}{dx^3} - 4x^2 \frac{d^2 y}{dx^2} + 8x \frac{dy}{dx} - 8y = 4 \ln x$$

Problem 3. (25%)

Please prove the following Laplace transform formulas

$$L\left\{\int_0^t \frac{f(\tau)}{\tau} d\tau\right\} = \frac{1}{s} \int_s^\infty F(s^*) ds^*$$

where L is Laplace transform and $L\{f(t)\} = F(s)$

Problem 4. (25%)

a) (20%) Please solve the Legendre equation solution near at $x=0$

$$(1-x^2)y'' - 2xy' + p(p+1)y = 0$$

b) (5%) What is the convergence region for the above solution?