

# 國立臺北科技大學

九十四學年度土木與防災研究所入學考試

## 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. Solve the initial value problem

$$y'' - 4y' + 4y = xe^{2x} + \sin 2x$$

$$y(0) = 0 ; y'(0) = 1 \quad (15\%)$$

2. Use the Laplace transform to solve the initial value problem

$$\frac{dy}{dt} + 3y = 13\sin 2t ; y(0) = 6 \quad (15\%)$$

3. Solve the following partial differential equation

$$c^2 \frac{\partial^2 u}{\partial x^2} - \frac{\partial^2 u}{\partial t^2} = 0 \quad (0 < x < a, t > 0)$$

with the boundary conditions

$$u(0, t) = u(a, t) = 0$$

and initial conditions

$$u(x, 0) = f(x)$$

$$\frac{\partial u}{\partial t}(x,0) = g(x)$$

where  $a$  and  $c$  are coefficients. (20%)

4. If  $A = \begin{bmatrix} -2 & 4 \\ -1 & 3 \end{bmatrix}$ , find  $A^6$ . (15%)

5. Expand  $f(x) = x^2$ , ( $0 < x < L$ ), in a Fourier series. (15%)

6. Solve  $X' = \begin{bmatrix} 4 & 2 \\ 2 & 1 \end{bmatrix} X + \begin{pmatrix} 3e^t \\ e^t \end{pmatrix}$  by diagonalization. (20%)