

國立臺北科技大學

九十三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. Find the angle between surface $X^2+Y^2+Z^2=6$ and $X/2+Y^2/2-Z=0$ at point(2,1,1). (10分)

2. Find eigenvalues and associated nonzero eigenvectors of the matrix. (15分)

$$[A] = \begin{bmatrix} 3 & 1 & 4 \\ 0 & 2 & 6 \\ 0 & 0 & 5 \end{bmatrix}$$

3. Find out what type of conic section is represented by the given quadratic form. Transform it to principle axes. Express $X^T=[X_1, X_2]$ in term of the new coordinate vector. $Y^T=[Y_1, Y_2]$; $3X_1^2+8X_1X_2-3X_2^2=5$ (15分)

4. Find the general solution of following ordinary differential equation.

(a) $4x(y')^2+2xy'-y=0$ (10分)

(b) $x(dy/dx)^3-2y(dy/dx)=16x^2$ (10分)

5. Solve X_1 and X_2 of the linear systems with the following governing equations.

(20 分)

$$X_1' = 5X_1 + 8X_2 + 1$$

$$X_2' = -6X_1 - 9X_2 + t$$

6. Solve the following boundary value problem. (20 分)

$$\frac{\partial u}{\partial t} - 2 \frac{\partial^2 u}{\partial x^2} = 0, \quad 0 < x < \pi, \quad t > 0$$

$$t > 0 : u(0, t) = 0, \quad u(\pi, t) = 0,$$

$$u(x, 0) = \pi \quad 0 < x < \pi/2 ; \quad u(x, 0) = \pi - x \quad \pi/2 < x < \pi$$