

國立臺北科技大學九十七學年度碩士班招生考試

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第一節 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. 本試題共五題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一. Find the general solution of the following differential equations.

(a) $y' = y / (y^4 + 3x)$

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(b) $x^2 y'' - 2xy' + 2y = x^3 e^{-3x}$

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二. (a) Solve the initial value problem by using Laplace Transform.

$$y'' - 4y' + 13y = 4\delta(t-3)$$

$$y(0) = y'(0) = 0$$

Where $\delta(t)$ is the Dirac's delta function.

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(b) Find the inverse Laplace Transform.

$$s e^{-10s} / (s^2 + 4)^2$$

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三. (a) Find the eigenvalues of the given matrix.

$$\begin{pmatrix} 3 & 0 & -2 \\ 0 & 2 & 0 \\ -2 & 0 & 0 \end{pmatrix}$$

(b) Find the corresponding eigenvector for each eigenvalue.

(c) Find an orthogonal matrix that diagonalizes this given matrix.

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四. Use Green's Theorem to evaluate $\oint_C xy dx + (xy^2 - e^{\cos(y)}) dy$

where c is oriented counterclockwise triangle with vertices $(0,0)$, $(3,0)$, $(0,5)$.

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五. Consider the curve given by the parametric equations as

$$x = \cos(t) + t \sin(t)$$

$$y = \sin(t) - t \cos(t)$$

$$z = t^2$$

(a) find a length function $s(t)$ for the curve.

(b) find the unit tangent vector and unit normal vector as a function of s .

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