

國立虎尾科技大學 101 學年度研究所 (碩士班) 考試入學試題

所別：機械設計工程系碩士班

科目：考試科目 1 (工程數學)

注意事項：

(1) 計算與問答題共五題，每題二十分，共一百分。

(2) 請於答案卷上註明題號。

一、計算題(每題 20 分)

1. (a) Solve $y'' - 2y' + y = 0$; (b) if general solution $y = c_1y_1 + c_2y_2$, evaluate the Wronskian $W(y_1, y_2)$.
(20%)

2. (a) Find the Laplace Transform of $r(t) = 1$ if $1 < t < 2$ and 0 otherwise; (b) Solve $y'' + 3y' + 2y = r(t)$, $y(0) = y'(0) = 0$ by Laplace Transforms.
(20%)

3. A system of linear equations is given as follows:

$$AX = B \quad \text{where } A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 4 & 2 & 1 \end{bmatrix}, \quad X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 1 \\ 2 \\ 6 \end{bmatrix}$$

(a) Evaluate the ranks of A and $[A|B]$. (b) Solve it by Gauss elimination method.
(20%)

4. Given a matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, find

(a) Determinant of A ($|A|$); (b) Transpose of A (A^T); (c) Evaluate the eigenvalues and eigenvectors of A . ($Ax = \lambda x$); (d) Calculate the diagonal matrix $D = X^{-1}AX$ where X is composed of eigenvectors of A .
(20%)

二、問答題 (每小題 10 分，共 20 分)

1. (a) 請將下列工程數學之各章節內容由英文翻譯成中文。
(10%)

Laplace Transform; Linear Algebra; Vector Calculus; Fourier Transform.

(b) 請以二階線性齊次問題舉例簡述常微分方程式(ODE)與偏微分方程式(PDE)之差異?
(10%)