

國立臺北科技大學九十八學年度碩士班招生考試

系所組別：2111 2112 2120 2130 電機工程系碩士班甲乙丙組

第二節 工程數學 試題

第一頁 共一頁

注意事項：

1. 本試題共七題，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。

1. (15%) Let $A = \begin{bmatrix} 1 & 3 & 2 & 1 \\ 2 & 1 & 2 & 3 \\ 3 & 0 & 1 & 2 \\ 1 & 2 & 0 & 1 \end{bmatrix}$. Find the inverse of and the determinant of A .

2. Let $B = \begin{bmatrix} -1 & 2 & 2 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 \\ -6 & 3 & 6 & 0 & 0 \\ 0 & 0 & 0 & -12 & 25 \\ 0 & 0 & 0 & -9 & 18 \end{bmatrix}$.

- (a) (5%) Find the inverse of B ;
- (b) (15%) Find all eigenvalues of B and the corresponding eigenvectors.

3. (15%) Prove in English that "If A is an $m \times n$ matrix, the dimension of the row space of A equals the dimension of the column space of A ". (No credit will be given if the answer is given in Chinese)

4. (15%) Find the general solution : $y'' + 25y = -6x \sin(5x)$

5. (15%) Find the inverse Laplace transform : $\frac{2s+2}{(s^2+2s+10)^2}$

6. (10%) Find the general solution : $(4x^3 + y^3 + 2) dx + xy^2 dy = 0$

7. (10%) An object having a temperature of 90 degrees Fahrenheit is placed into an environment kept at 60 degrees. Ten minutes later, the object has cooled to 87 degrees. According to Newton's law of cooling, the rate of decrease temperature is proportional to the difference in temperature between the object and the environment. How long will it take for the object to cool to 70 degrees?

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