

國立臺北科技大學九十九學年度碩士班招生考試

系所組別：2210 電腦與通訊研究所甲組

第一節 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。

一、
For the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}$, and vector $b = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$,

1. Find the inverse matrix of A . (5%)
2. Find the solution to the system $Ax = b$. (5%)

二、
Find the least squares solution to the following system.

$$\begin{aligned} x_1 + x_2 &= 3 \\ 2x_1 - 3x_2 &= 1 \\ 0x_1 + 0x_2 &= 2 \end{aligned} \quad (15\%)$$

三、

The matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 5 & 6 \\ -2 & 2 & 7 \end{bmatrix}$ has a LU -factorization, $A = LU$. Please find the matrix L

and U , where L is a unit lower triangular matrix, and U is an upper triangular matrix. (15%)

四、

Find all eigenvalues and the corresponding eigenvectors of the matrix A below.

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix} \quad (15\%)$$

五、

A memory module may come from any one of the three factories A, B, and C with probabilities $P_A = 0.5$, $P_B = 0.3$, and $P_C = 0.2$. The probabilities that the memory module will be defective during the manufacturing process are 0.02, 0.01, and 0.035, respectively.

1. Find the probability that a randomly chosen memory module will be defective. (10%)
2. If the chosen memory module is defective, what is the probability that this memory module comes from factory A? (10%)

六、

Consider the game of a fair coin tossing. The coin is tossed 2 times. Let X represents the number of times head appears. Please find the value of $E(X^2)$, i.e., expected value of X^2 . (15%)

七、

Consider a computer network that uses packet switching. There are M users in the network that share a backbone link, and each of them is busy generating data only with probability $p = 0.1$. Please give a formula (in terms of p , M , N) for the probability that more than N users, i.e., $(N+1)$, $(N+2)$, ..., M users, are sending data simultaneously. (10%)