編號： 200

國立成功大學 106 學年度碩士班招生考試試題

系　　所：製造資訊與系統研究所

考試科目：工程數學

考試日期：0213，節次：2

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. (20%) Find a unit vector n perpendicular to the plane $4x + 2y + 4z = -7$?

2. (20%) Find the eigenvalues λ_1, λ_2 and eigenvectors x_1, x_2 of the matrix $A = \begin{pmatrix} 5 & 4 \\ 1 & 2 \end{pmatrix}$?

3. (20%) Given following equations:

$$2x_1 - 9x_2 = 15$$
$$3x_1 + 6x_2 = 16.$$

   1) Please write them to be the format as $Ax=b$, where A is a 2x2 matrix, x is a 2x1 vector and b is also a 2x1 vector. (10%)
   2) Please solve unknown x vector? (10%)

4. (20%) The quadratic from is $Q = x^T Ax = 2x_1^2 + x_1x_2 - 3x_2^2$
   1) What is the coefficient matrix A? (10%)
   2) What is the corresponding symmetric matrix C? That is, $Q = x^T Cx$ (10%)

5. (20%) For Sum of Squared Differences (SSD) problem, please solve the unknown parameter h

$$\min \; E = \sum_{x \in R} [I(x+h) - F(x)]^2$$

by first order Taylor series expansion: $I(x+h) \approx I(x) + h\frac{\partial I(x)}{\partial x}$　　That is, starting from $\frac{\partial E}{\partial h} =$