系組： 電機系、電機海外、生醫所、光電系　　　准考證號碼：□□□□□□

科目： 工程數學(146)　　　　　　　　　　　　　　　　（請考生自行填寫）

注意事項	一、 請先檢查准考證號碼、報考系(組)別、考試科目名稱，確定無誤後再作答。 二、 所有答案應寫於答案紙上，否則不予計分。 三、 作答時應依試題題號，依序由上而下書寫，作答及未作答之題號均應抄寫。

1. Solve the following first-order differential equations. (16%)

   (a) $x\dfrac{dy}{dx} - 4y = x^5 e^{2x}$　　　　(b) $\dfrac{dy}{dx} = y^2 - 9$

2. Find the Laplace transformation of the following equations. (12%)

   (a) $e^{3t}(9 - 4t + 10\sin\dfrac{t}{2})$　　　(b) $t\sin kt$

3. For a second-order differential equation, solve the given initial-value problem. (12%)

   $\dfrac{d^2 x}{dt^2} + \omega^2 x = F_0 \sin\omega t$,　　$x(0) = 0, \dfrac{dx(0)}{dt} = 0$

4. Use the Laplace transformation to solve the initial-value problem. (10%)

   $\dfrac{dx}{dt} + 3x = 13\sin 2t$,　　$x(0) = 6$

5. If $A = \begin{pmatrix} 1 & 2 & -1 \\ 1 & 0 & 1 \\ 4 & -4 & 5 \end{pmatrix}$　(a) find A^{-1} by Gauss elimination method　　(6%)

   (b) find A^{-1} by adjoint matrix method　　(6%)

   (c) find the matrix P that diagonlizes A and the diagonal matrix D
       such that $D=P^{-1}AP$　　(12%)

6. (a) Expand　$f(x) = e^{-2x}$　$-\pi < x < \pi$　in a complex Fourier series　(8%)

   (b) find $f(x) = e^{-2|x|}$　$-\infty < x < \infty$　as a Fourier transform　(8%)

7. Four points P_0 (0, 0, 1),　P_1 (3,5,2),　P_2 (2,2,1),　P_3 (-1,-1,4)　**and**　$A=P_0 P_1$, $B= P_0 P_2$,

   $C= P_0 P_3$, find (a) the projection of vector **A** on **B** (*Proj $_B$A*)　　(5%)

   (b) the plane equation that contains P_1, P_2, P_3 **points**　　(5%)