招生學年度	101	招生類別	碩士班
系所班別	光電工程學系碩士班(甲組、乙組)、材料科學與工程學系碩士班		
科目	工程數學		
注意事項	本考科可使用掌上型計算機		

1. Solve $y'-2xy = x, y(0) = 1$ *(10%)*

2. Solve $y'' - 2y' + 2y = 2e^x \cos x$ *(10%)*

3. Solve by Laplace Transform $y'' + y = 2t, y\left(\frac{\pi}{2}\right) = \pi, y'\left(\frac{\pi}{2}\right) = 1$ *(20%)*

4. Let f(x)=1, for 0<x<1, Suppose that f(x) is represented by a Fourier series of the form $f(x) = \sum_{n=1,3,5}^{\infty} b_n \sin\frac{n\pi x}{2}$

   (a) What is the period of the Fourier series (5%)
   (b) Find b_n (5%)
   (c) At x=0,1, -1, and -2, what values does the series converges to? (10%)

5. Does the inverse of matrix A exist? If yes, find A^{-1}. If not, say why?

$$A=\begin{bmatrix} -1 & 1 & 2 \\ 3 & -1 & 1 \\ -1 & 3 & 4 \end{bmatrix}$$ *(10%)*

6. Find the eigenvalues and eigenvectors of $A=\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ *(15%)*

7. Prove $\vec{A}\times(\vec{B}\times\vec{C})+\vec{B}\times(\vec{C}\times\vec{A})+\vec{C}\times(\vec{A}\times\vec{B})=0$ *(15%)*