

招生學年度	106	招生類別	碩士班
系所班別	電機工程學系碩士班、材料科學與工程學系碩士班、光電工程學系碩士班		
科目名稱	工程數學		
注意事項	本考科可使用掌上型計算機		

(10%) 1. Which equation is nonlinear?

- (A) $y'''' - y''' - 2y' + 2y = 3e^{-x}$ (B) $y'' + 4y = 10 \sin x$ (C) $y' + xy' = 6x$ (D) $y''' + 4y' - 3y = \sin x$ (E) None

(10%) 2. (a) Is the equation $3x^2 y dx + (2x^3 - 2) dy = 0$ exact? (b) Please find the solution of this equation!

(10%) 3. Solve the differential equation: $y^{(3)} - 4y'' - y' + 4y = 0$

(10%) 4. 試以 Laplace transform 求 O.D.E $y'' - 4y' + 3y = 10e^{-2t}$, $y(0) = 2$, $y'(0) = 2$

(10%) 5. 若 $F\{f(x)\}$ 的 Fourier transform 為 $F(\omega)$ 則 $F\{f(x-a)\}$ 為何?

- (A) $e^{ia\omega} F(\omega)$ (B) $F(\omega - a)$ (C) 1

(14%) 6. Matrix $A = \begin{bmatrix} 1+i & -1+2i \\ 3+2i & 2+i \end{bmatrix}$ Matrix $B = \begin{bmatrix} 1 & -2 \\ 4 & 2i \end{bmatrix}$
Find (a) $-2A+3B$ (b) BA

(12%) 7. Find the (a) eigenvalues and (b) eigenvectors of the matrix $\begin{bmatrix} 1 & 2 & 1 \\ 6 & -1 & 0 \\ -1 & -2 & -1 \end{bmatrix}$

(12%) 8. Let matrix $A = \begin{bmatrix} 8 & 0 & 1 \\ 3 & -2 & 1 \\ 1 & 4 & 0 \end{bmatrix}$ Find the inverse matrix A^{-1} .

(12%) 9. A tetrahedron is determined by three edge vectors $\vec{a}, \vec{b}, \vec{c}$

$$\text{where } \vec{a} = \vec{i} + 2\vec{k} \quad \vec{b} = 4\vec{i} + 6\vec{j} + 2\vec{k} \quad \vec{c} = 3\vec{i} + 3\vec{j} - 6\vec{k}$$

Find the volume V of the tetrahedron.