

明新科技大學九十三年學年度研究所碩士班  一般生  在職生 招生考試入學試題卷

系所別	組別	科目	考試日期	節次	時間
電機工程研究所		工程數學	93年5月2日	第一節	

1.  $y' + y \tan x = \sin 2x$  ,  $y(0) = 1$  , Solve this Differential Equation. (10%)

2.  $y'' + 2y' + y = e^{-x}$  ,  $y(0) = -1$  ,  $y'(0) = 1$  , Solve this Differential Equation. (10%)

3. Find the inverse Laplace transform  $\mathcal{L}^{-1}\left[\frac{1}{s^2(s^2 + \omega^2)}\right] = ?$  (10%)

4. Find the Laplace transform  $\mathcal{L}[e^{-5t} \sin 3t] = ?$  (10分)

5. Find the inverse Laplace transform  $\mathcal{L}^{-1}\left[\frac{1}{s(s+1)(s+2)}\right] = ?$  (10%)

6. Let  $a$  be a positive constant and  $g$  be the function defined as  $g(x) = u(x+a) - u(x-a)$  where the function  $u(x)$  represents the unit step function.

(1) Find the Fourier transform of  $g(x)$ . (5%)

(2) Use the inverse Fourier transform and the answer of (1) to find the Fourier transform of  $h(x) = \sin(x)/x$ . (5%)

7. Let  $f(x)$  be a periodic function with a fundamental period  $T = 2$ . Suppose  $f(x) = e^{2x}$ ,  $\forall 0 \leq x \leq 1$ . Find the Fourier cosine series as well as the Fourier sine series by using the half-range expansion. (10%)

8. Find the determinant  $\begin{vmatrix} 1 & 1 & 1 & 1 \\ 1 & a & a^2 & a^3 \\ 1 & b & b^2 & b^3 \\ 1 & c & c^2 & c^3 \end{vmatrix}$ . (10%)

9. Let  $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$  and  $B = \begin{bmatrix} 4 & 3 \\ 2 & 1 \end{bmatrix}$ .

(1) Compute  $AB$  and  $BA$ . (5%)

(2) Although  $AB \neq BA$ , the determinant  $|AB|$  is still equal to the determinant  $|BA|$ . Please give a proof to show that  $|CD| = |DC|$  for any square matrices  $C$  and  $D$ . (5%)

10. Let  $v = [1, 2, 3]$ ,  $w = [3, 2, 1]$  and  $u = [1, -1, 1]$ .

(1) Find  $(v \times w) \cdot u$  where the notations  $\times$  and  $\cdot$  denote the cross product and the inner product, respectively. (5%)

(2) Find  $(u \times w) \times v$ . (5%)