

明新科技大學 98 學年度研究所招生考試 試題卷

系所名稱	類別	科目	節次	准考證號碼 (考生請填入)	考試日期
電機工程研究所 (電機組)	碩士班	工程數學	第一節		98/5/3

※答案須寫在答案卷內，否則不予計分。

- Find the general solution of the differential equation  $\frac{dy}{dx} + 3y = y^{\frac{1}{2}}$ . (10%)
- Solve the equation  $x^2 y'' - 4xy' + 6y = 0$  with  $y(1) = 3$  and  $y'(1) = 5$ . (10%)
- Find a particular solution  $y_p(x)$  of the equation  $y'' + 4y' + 5y = 10 \cos 3x$ . (10%)
- Use the Laplace transform method to solve  $y'' + 5y' + 6y = 4e^{-t}$  with  $y(0) = y'(0) = 0$ . (10%)
- Find the inverse Laplace transform  $\mathcal{L}^{-1} \left[ \frac{3s - 21}{s^2 + 6s + 45} \right] = ?$  (10%)
- Find the Fourier series of  $f(x)$ , of period  $p = 2L$ , where  $f(x) = 2x, \forall |x| < 1, p = 2$ . (10%)
- Find the half-rang expansion of Fourier series of  $f(x)$ , of period  $p = 2L$ , where  $f(x) = |x| - x^3, \forall 0 < x < 1, p = 2$ . (10%)
- (a) Find the Fourier transform of 
$$f(x) = \begin{cases} 1, & |x| < 2 \\ 0, & \text{otherwise.} \end{cases} \quad (5\%)$$

(b) Use the Parseval's identity and the result obtained in (a) to find  $\int_0^{\infty} \frac{\sin^2 x}{x^2} dx$ . (5%)

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9. Compute the following determinants:

$$(a) \begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix}. \quad (5\%)$$

$$(b) \begin{vmatrix} 1 & 2 & 3 & 4 & 5 \\ 1 & 3 & 5 & 7 & 9 \\ 1 & 2 & 4 & 8 & 16 \\ 1 & 3 & 1 & 3 & 1 \\ 1 & 4 & 3 & 2 & 0 \end{vmatrix} \quad (5\%)$$

10. Let

$$A = \begin{bmatrix} 1 & 2 \\ -1 & 1 \end{bmatrix}, \quad B = \begin{bmatrix} 1 \\ -1 \end{bmatrix}.$$

(a) Find  $A^{-1}B$ . (5%)

(b) Find the eigenvalues (or characteristic values) of  $A$ . (5%)