國立雲林科技大學
94 學年度碩士班入學招生考試試題

系所：電機系
科目：工程數學

1. Given that the Laplace transform $\mathcal{L}\{\frac{2}{t}[1-\cos(t)]\} = \ln(\frac{s^2+1}{s^2})$,

   please find the value of $\mathcal{L}\{\frac{1}{t}[1-\cos(2t)]\}$ (10%)

2. Find the inverse Laplace transform for the following function. (10%)

$$\frac{se^{-s}}{(s+1)^2(s^2+2s+2)}$$

3. Find the general solution for the following differential equations. (30%)

   (a) $(D^4+5D^2-36)y(x) = 10e^{-2x}+3\cos(3x)$. (10%)

   (b) $(x^3D^3+3x^2D^2+xD-1)y(x) = 0$. (10%)

   (c) $\frac{dy}{dx} = \frac{6xy-y^2}{3xy-6x^2}$. (10%)

4. Find the Fourier half cosine and Fourier half sine expansions of $f(x)$ for

$$f(x) = \begin{cases} 1, & 0 < x < 1 \\ 2-x, & 1 \le x < 2 \end{cases}$$ (15%)

5. Solve the following integral equation for the function $f(x)$

$$\int_0^\infty f(x)\sin(\omega x)dx = \begin{cases} 1, & 0 < \omega < 1 \\ 0, & \omega > 1 \end{cases}$$ (10%)

6. Determine the polynomial $y = a_0 + a_1x + a_2x^2$ whose graph passes through the points (x, y) of (1, 9), (2, 18), and (3, 31). (10%)

7. Consider the following linear equations **Ax=b**,

$$\begin{cases} x_1 \quad\quad\; -2x_3 + x_4 = 4 \\ 3x_1 + x_2 - 5x_3 \quad\quad = 8 \\ x_1 + 2x_2 \quad\quad -5x_4 = -4 \end{cases}$$

   Write the solution in the form **x**$=x_h + x_p$, where x_h is the solution of **Ax=0** and x_p is a particular solution of **Ax=b**. (8%)

8. Let A be an 4×4 invertible matrix and $adj\,(A)$ be the adjoint of A. Find the value x of the determinant $|adj(A)| = |A|^x$. (7%)