銘傳大學 98 學年度轉學生招生考試

生物醫學工程學系、電子工程學系

7 月 23 日第三節

工程數學試題

（第 1 頁共 1 頁）（限用答案本作答）　　☐可使用計算機 ☑不可使用計算機

1. Solve $\frac{dy}{dx} = y^2 e^{-x}$, $y(x) = ?$ (10%)

2. Solve $y' = 3x^2 - \frac{y}{x}$, $y(1) = 5$, $y(x) = ?$ (10%)

3. Solve $y'' + 2y' + 6y = 0$, $y(x) = ?$ (10%)

4. Solve $y'' + 4y = x + 2e^{-2x}$, general solution $y(x) = ?$ (10%)

5. Solve the following ODE with Laplace Transform (10%)
   $y'' + 4y' + 3y = e^t$, $y(0) = 0$, $y'(0) = 2$

6. Find the Fourier Series of the function (15%)

$$f(t) = \begin{cases} -1 & -\frac{T}{2} < t < 0 \\ 1 & 0 < t < \frac{T}{2} \end{cases}, \quad f(t+T) = f(t),\ T\text{: period}$$

7. Find the Fourier Transform of the following function (10%)

$$f(t) = \begin{cases} 1 & |t| < \frac{d}{2} \\ 0 & |t| > \frac{d}{2} \end{cases}$$

8. Solve $\frac{\partial u}{\partial t} = k\frac{\partial^2 u}{\partial x^2}$, $0 < x < \ell$, $0 < t$ (15%)

   Boundary conditions: $\frac{\partial u}{\partial x}(0,t) = 0$, $\frac{\partial u}{\partial x}(\ell,t) = 0$

   Initial condition: $u(x,0) = f(x)$

9. Solve

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 2 & -2 & -1 & 2 \\ 3 & -1 & 2 & 2 \\ 1 & -1 & -2 & 1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 3 \\ 0 \\ 2 \\ 0 \end{bmatrix} \quad (10\%)$$

試題完