

國立彰化師範大學 100 學年度碩士班招生考試試題

系所：資訊工程學系積體電路設計碩士班

科目：工程數學

☆☆請在答案紙上作答☆☆

共 1 頁，第 1 頁

1. Solve the differential equation: $yy' + 25x = 0$. (6%)
2. Solve the initial value problem: $y'' + y' - 6y = 0$, $y(0) = 10$, $y'(0) = 0$. (8%)
3. Solve the initial value problem: $y'''' + 3y'' + 3y' + y = 36e^{-x}$, $y(0) = 2$, $y'(0) = 3$, $y''(0) = 0$. (16%)
4. Solve the initial value problem by the Laplace transform: $y' - 5y = 1.5e^{-4t}$, $y(0) = 1$.

(Hint: $L(e^{at}) = \frac{1}{s-a}$, $L(f') = sL(f) - f(0)$) (8%)

5. Solve the system by the Gauss elimination:
$$\begin{cases} x + y - z = 9 \\ 8y + 6z = -6 \\ -2x + 4y - 6z = 40 \end{cases} \text{ (6%)}$$

6. Solve the system by the Cramer's rule:
$$\begin{cases} 5x - 3y = 37 \\ -2x + 7y = -38 \end{cases} \text{ (6%)}$$

7. Find the tangent to the ellipse $\frac{1}{4}x^2 + y^2 = 1$ at $P: (\sqrt{2}, \frac{1}{\sqrt{2}})$. (25%)

8. Find the Fourier series of the function of the periodic square wave $f(x)$. (25%)

$$f(x) = \begin{cases} 0 & \text{if } -2 + 4n < x < -1 + 4n \\ k & \text{if } -1 + 4n < x < 1 + 4n \\ 0 & \text{if } 1 + 4n < x < 2 + 4n \end{cases} \text{ where } n \text{ is an integer.}$$

