

國立臺灣師範大學 105 學年度碩士班招生考試試題

科目：工程數學

適用系所：電機工程學系

注意：1.本試題共 1 頁，請依序在答案卷上作答，並標明題號，不必抄題。2.答案必須寫在指定作答區內，否則依規定扣分。

1. (10 分) Find the general solution of $xy' - y = y^2$.
2. (10 分) Find the general solution of $xy''' - \frac{2}{x}y' = 0$.
3. (15 分) Find the power series solution of $xy'' - y = 0$ around $x = 0$, up to 3 nonzero terms.
4. (15 分) Find the Laplace transform $L[V_{out}(x)]$ for the output signal $V_{out}(x)$ of a half-wave-rectifier circuit as shown in Fig. 1.

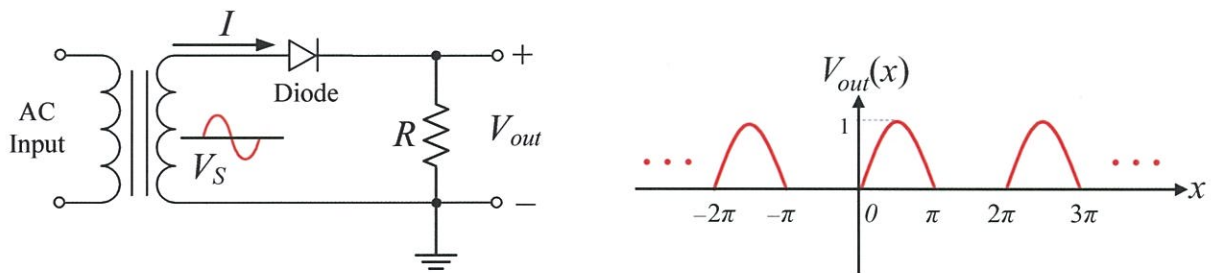


Fig. 1

5. (10 分) Find the solution of $y(x) = x^2 + \int_0^x y(x-\tau)e^{-\tau}d\tau$ using Laplace transform.
6. (10 分) Use the Fourier transform to find the solution of $y' + 2y + 8e^{-4x}H(x) = 0$ in which $H(x)$ is a Heaviside unit step function.
7. (15 分) Find the Fourier Series of the periodic function $f(x)$ as shown in Fig.2.

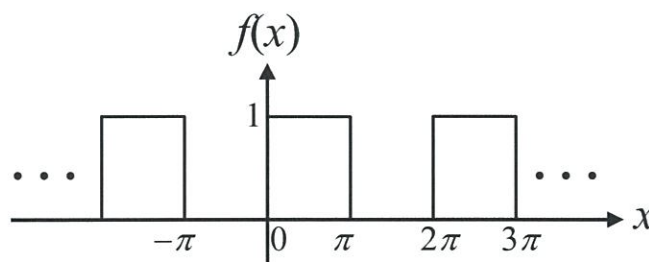


Fig. 2

8. (5 分) Find the solution of the following linear equations using Cramer's Rule.

$$\begin{cases} 2x_1 + x_2 - 3x_3 = 0 \\ x_1 + 3x_2 - 2x_3 = 2 \\ x_1 - x_2 + x_3 = 1 \end{cases}$$

9. (10 分) Find the Jordan canonical form of the matrix $A = \begin{bmatrix} 2 & -2 \\ 4 & 8 \end{bmatrix}$.