

大同大學 九十 學年度研究所碩士班入學考試試題

考試科目：工程數學

所別：電機工程研究所

第 1/2 頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

1. Solve the problem ($\delta(t)$ is defined as the impulse function).

$$\frac{d^2 y}{dt^2} - \frac{dy}{dt} - 6y = 4e^{-t} + \delta(t-3), \quad y(0)=1, \quad y'(0)=0.$$

2. Find the current $i(t)$ in the circuit (shown in Fig.2(a)) if the input $v(t)$ (shown in Fig.2(b)) is applied. Assume that current and charge are zero at $t=0$, $C=1$ farad, $R=1$ ohm.

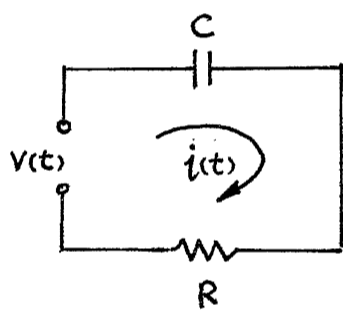


Fig.2(a)

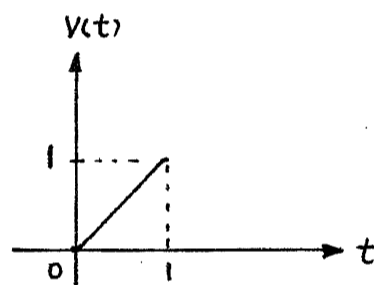


Fig.2(b)

3. Let $f(x) = \begin{cases} 1 & \text{if } |x| < \frac{\pi}{2} \\ 0 & \text{if } \frac{\pi}{2} < |x| < \pi \end{cases}$, and $f(x) = f(x+2\pi)$.

(a) Find the Fourier series of $f(x)$.

(b) Find the sum of $1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots$

TO BE CONTINUED

大同大學 九十 學年度研究所碩士班入學考試試題

考試科目：工程數學

所別：電機工程研究所

第 2/2 頁

註：本次考試 不可以參考自己的書籍及筆記； 不可以使用字典； 不可以使用計算器。

4. Find a matrix P that diagonalizes the matrix A , and determine $P^{-1}AP$

$$A = \begin{bmatrix} 3 & 1 & 1 \\ 2 & 4 & 2 \\ -1 & -1 & 1 \end{bmatrix}.$$

5. Given the following homogeneous system.

$$\begin{cases} 2x_1 + 2x_2 - x_3 & + x_5 = 0 \\ -x_1 - x_2 + 3x_3 - 2x_4 + 2x_5 = 0 \\ x_1 + x_2 - 5x_3 & - 4x_5 = 0 \\ & x_3 + x_4 + x_5 = 0 \end{cases}$$

- (a) Determine a basis for the solution space.
(b) Find the dimension of the solution space.

6. The joint probability density function of X and Y is given by the function

$$f(x, y) = \begin{cases} kx(1+3y^2) & , 0 < x < 2, 0 < y < 1 \\ 0 & , \text{elsewhere} \end{cases}$$

- (a) Determine the value of k .
(b) Find $f(x|y)$.
(c) Evaluate the expectation of X given that $Y = \frac{1}{3}$.

題號	1	2	3	4	5	6
配分	16	18	18	16	16	16