

## 习题 1 部分参考答案

2. a) 确定、连续、周期信号  
 c) 确定、离散、非周期信号  
 e) 随机、连续、非周期信号  
 b) 确定、连续、非周期信号  
 d) 确定、连续、非周期信号  
 f) 确定、离散、数字信号
3. a)  $f(t) = \frac{t}{2}[\varepsilon(t) - \varepsilon(t-2)]$   
 b)  $f(t) = t\varepsilon(t) - \varepsilon(t-1) - (t-1)\varepsilon(t-2)$   
 c)  $f(t) = (t+1)\varepsilon(t) - t\varepsilon(t) - \varepsilon(t-2) + 1.5\delta(t-3)$   
 d)  $f(t) = (1 - |t|)[\varepsilon(t+1) - \varepsilon(t-1)]$
4. (1) 周期信号, 周期  $T = 12$  (2) 非周期信号  
 (3) 周期信号, 周期  $T = \frac{\pi}{2}$  (4) 周期信号, 周期  $T = \pi$   
 (5) 非周期信号 (6) 非周期信号  
 (7) 非周期信号 (8) 非周期信号
5. (1) 错误 (2) 错误 (3) 错误  
 (4) 正确 (5) 错误 (6) 错误
7. (1)  $f_1(t) = \delta(t-1)$  (2)  $f_2(t) = \delta(t)$   
 (3)  $f_3(t) = \frac{1}{2}e^2\delta(t+1)$  (4)  $f_4(t) = \delta(t) - \sin t\varepsilon(t)$   
 (5)  $f_5(t) = \delta'(t) + \delta(t)$  (6)  $f_6(t) = \frac{1}{4}\delta\left(t - \frac{1}{2}\right)$
8. (1)  $f(-t_0)$  (2)  $f(t_0)$   
 (3)  $\begin{cases} 1 & t_0 > 0 \\ 0 & t_0 < 0 \end{cases}$  (4)  $\begin{cases} 1 & t_0 < 0 \\ 0 & t_0 > 0 \end{cases}$   
 (5)  $\sin\theta$  (6) 1  
 (7)  $\frac{13}{8}$  (8)  $1 - e^{-j\omega t_0}$
10. (1)  $f_e(t) = \frac{1}{2}$   $f_o(t) = \frac{1}{2}\text{sgn}(t)$   
 (2)  $f_e(t) = \frac{1}{\sqrt{2}}\cos(\omega_0 t)$   $f_o(t) = \frac{1}{\sqrt{2}}\sin(\omega_0 t)$   
 (3)  $f_e(t) = \cos(\omega_0 t)$   $f_o(t) = j\sin(\omega_0 t)$
11. (1) 线性、时不变、因果 (2) 线性、时变、因果  
 (3) 非线性、时变、因果 (4) 线性、时变、非因果  
 (5) 线性、时变、非因果 (6) 非线性、时不变、因果  
 (7) 线性、时不变、因果 (8) 线性、时变、非因果
12. (1) 可逆, 逆系统为  $y^{(-1)}(t) = f(t+6)$   
 (2) 不可逆, 如  $f(t) = 2t+3$  与  $f(t) = 2t+4$  可以产生同样的输出  
 (3) 可逆, 逆系统为  $y^{(-1)}(t) = f'(t)$   
 (4) 可逆, 逆系统为  $y^{(-1)}(t) = f\left(\frac{1}{3}t\right)$
13.  $y_2(t) = \delta(t) - \alpha e^{-\alpha t}\varepsilon(t)$

## 习题 2 部分参考答案

1. (1)  $e^{-t}(\cos t + 3\sin t)$       (2)  $(3t+1)e^{-t}$       (3)  $1 - (t+1)e^{-t}$

2. (1)  $\underbrace{4e^{-t} - 3e^{-2t}}_{\text{零输入响应}} - \underbrace{2e^{-t} + \frac{1}{2}e^{-2t} + \frac{3}{2}}_{\text{零状态响应}}$

(2)  $\underbrace{4e^{-t} - 3e^{-2t}}_{\text{零输入响应}} + \underbrace{e^{-t} - e^{-2t}}_{\text{零状态响应}}$ , 强迫响应等于零。

3.  $h(t) = \frac{1}{2}\delta(t) + \frac{1}{2}e^{-3t}\varepsilon(t)$

$g(t) = \left(\frac{2}{3} - \frac{1}{6}e^{-3t}\right)\varepsilon(t)$

4.  $h(t) = \frac{1}{3}\delta(t) + \frac{1}{6}e^{-\frac{1}{2}t}\varepsilon(t)$

$g(t) = \frac{2}{3} - \frac{1}{3}e^{-\frac{1}{2}t}\varepsilon(t)$

5. (1)  $h(t) = e^{-2t}\varepsilon(t)$

(2)  $h(t) = \frac{1}{4}\sin(2t)\varepsilon(t)$

(3)  $h(t) = e^{-t}\varepsilon(t)$

(4)  $h(t) = 2\delta(t) - 6e^{-3t}\varepsilon(t)$

(5)  $h(t) = \delta'(t) + \delta(t) - (2e^{-t} + 3e^{-2t})\varepsilon(t)$

7. (1)  $\frac{1}{\alpha}(1 - e^{-\alpha t})\varepsilon(t)$

(2)  $\cos(\omega t + 45^\circ)$

(3) 
$$\begin{cases} 0 & t < 1, t > 3 \\ \frac{1}{2}(t^2 - 1) & 1 < t < 2 \\ -\frac{1}{2}t^2 + t + \frac{3}{2} & 2 < t < 3 \end{cases}$$

(4)  $\cos[\omega(t+1)] - \cos[\omega(t-1)]$

(5)  $\frac{\alpha \sin t - \cos t + e^{-\alpha t}}{\alpha^2 + 1}\varepsilon(t)$

8. (1)  $f(t) = (t-1)\varepsilon(t-1)$

(2)  $f(t) = t\varepsilon(t) - (t-1)\varepsilon(t-1) - (t-2)\varepsilon(t-2) + (t-3)\varepsilon(t-3)$

(3)  $f(t) = \frac{1}{2\pi}[1 - \cos(2\pi t)][\varepsilon(t) - \varepsilon(t-1)]$

(4)  $f(t) = (1 - e^{-(t-1)})\varepsilon(t-1)$

11.  $h(t) = \delta(t)$

15. (1)  $\begin{cases} e^{-t} - e^{-2t} & 0 < t < 2 \\ e^{-2t}(\beta e^4 + e^2 - 1) & t > 2 \end{cases}$

(2)  $\beta = e^{-4} \int_0^2 e^{2\tau} x(\tau) d\tau$

### 习题 3 部分参考答案

$$3. f_1(t) = \frac{4E}{\pi} \sum_{n=1}^{\infty} \frac{1}{n} \sin\left(\frac{n\omega_1\tau}{2}\right) \cos(n\omega_1 t) = \frac{2E}{\pi} \sum_{n=-\infty}^{\infty} \frac{1}{n} \sin\left(\frac{n\omega_1\tau}{2}\right) e^{jn\omega_1 t}$$

$$f_2(t) = \frac{1}{T_1} + \frac{2}{T_1} \sum_{n=1}^{\infty} \cos(n\omega_1 t) = \frac{1}{T_1} \sum_{n=-\infty}^{\infty} e^{jn\omega_1 t}$$

$$4. f_1(t) = \frac{E}{2} - \frac{4E}{\pi^2} \left[ \cos(\omega_1 t) + \frac{1}{9} \cos(3\omega_1 t) + \frac{1}{25} \cos(5\omega_1 t) + \dots \right]$$

$$f_2(t) = \frac{E}{2} + \frac{4E}{\pi^2} \left[ \sin(\omega_1 t) - \frac{1}{9} \sin(3\omega_1 t) + \frac{1}{25} \sin(5\omega_1 t) - \dots \right]$$

$$7. f(t) = \frac{E}{\pi} + \frac{E}{2} \left[ \cos(\omega_1 t) + \frac{4}{3\pi} \cos(2\omega_1 t) - \frac{4}{15\pi} \cos(4\omega_1 t) + \dots \right]$$

$$8. f(t) = \frac{E}{2} - \frac{jE}{2\pi} e^{j\omega_1 t} + \frac{jE}{2\pi} e^{-j\omega_1 t} - \frac{jE}{4\pi} e^{j2\omega_1 t} + \frac{jE}{4\pi} e^{-j2\omega_1 t} - \dots$$

$$= \frac{E}{2} + \frac{E}{\pi} \left[ \sin(\omega_1 t) + \frac{1}{2} \sin(2\omega_1 t) + \dots \right]$$

$$9. (1) f(t) = e^{-j(2t + \frac{\pi}{3})} + 2e^{-j(t + \frac{2\pi}{3})} + 2 + 2e^{j(t + \frac{2\pi}{3})} + e^{j(2t + \frac{\pi}{3})}$$

$$(3) f(t) = 2 + 4\cos\left(t + \frac{2\pi}{3}\right) + 2\cos\left(2t + \frac{\pi}{3}\right)$$

$$10. (1) F_1(j\omega) = \frac{\pi}{2} \left\{ \text{Sa}^2\left[\frac{\pi(\omega + \omega_0)}{2}\right] + \text{Sa}^2\left[\frac{\pi(\omega - \omega_0)}{2}\right] \right\}$$

$$(2) F_2(j\omega) = \pi \left\{ \text{Sa}\left[\pi(\omega + \omega_0)\right] e^{-j2\pi(\omega + \omega_0)} + \text{Sa}\left[\pi(\omega - \omega_0)\right] e^{-j2\pi(\omega - \omega_0)} \right\}$$

$$11. (1) F(j\omega) = [\mathcal{E}(\omega + 2\pi) - \mathcal{E}(\omega - 2\pi)] e^{-j2\omega}$$

$$(2) F(j\omega) = 2\pi e^{-\alpha|\omega|}$$

$$(3) F(j\omega) = \frac{1}{2} \left( 1 - \frac{|\omega|}{4\pi} \right) [\mathcal{E}(\omega + 4\pi) - \mathcal{E}(\omega - 4\pi)]$$

$$12. (1) F_1(j\omega) = 2\pi\delta(\omega) - j\frac{2}{\omega^2}\sin(\omega)$$

$$(2) F_2(j\omega) = -j\frac{2}{\omega^2}\sin(\omega)$$

$$(3) F_3(j\omega) = \pi\delta(\omega) - \frac{1}{j\omega} e^{-j\omega} - 2\frac{j}{\omega^2}\sin(\omega)$$

$$(4) F_4(j\omega) = [2\pi\delta(\omega) + 2\text{Sa}(\omega)]$$

$$13. F_1(j\omega) = \frac{2}{\omega^2} [\cos(\omega) - \cos(2\omega)]$$

$$F_2(j\omega) = \frac{1}{j\omega} (e^{-j\omega} - 2e^{-j2\omega} + e^{-j3\omega})$$

$$F_3(j\omega) = j\frac{2}{\omega} [\cos(\omega) - \text{Sa}(\omega)]$$

以上内容仅为本文档的试下载部分，为可阅读页数的一半内容。如要下载或阅读全文，请访问：<https://d.book118.com/76801122011006050>