

[IT CookBook] 기초 신호 및 시스템
: 개념과 원리가 한눈에 보이는 200여 개의 풍부한 예제

[연습문제 답안 이용 안내]

- 본 연습문제 답안의 저작권은 한빛아카데미(주)에 있습니다.
- 이 자료를 무단으로 전제하거나 배포할 경우 저작권법 136조에 의거하여 최고 5년 이하의 징역 또는 5천만원 이하의 벌금에 처할 수 있고 이를 병과(併科)할 수도 있습니다.

Chapter 06 연속 시간 푸리에 변환

[Quick Review]

- [1] Ans) 연속
- [2] Ans) \times
- [3] Ans) 에너지
- [4] Ans) \bigcirc
- [5] Ans) \bigcirc
- [6] Ans) \bigcirc
- [7] Ans) 진폭 스펙트럼
- [8] Ans) 허수
- [9] Ans) \times
- [10] Ans) 늘어난다
- [11] Ans) \bigcirc
- [12] Ans) \times
- [13] Ans) 주파수
- [14] Ans) \times
- [15] Ans) 초기 조건
- [16] Ans) \bigcirc
- [17] Ans) \bigcirc
- [18] Ans) 곱

[19] Ans) 합

[20] Ans) \times

[기초 문제]

6.1 Ans)

$$(a) \quad X(\omega) = \frac{4 - 2(e^{-j\omega} + e^{-j2\omega})}{j\omega}$$

$$(b) \quad X(\omega) = -\frac{e^{-(a+j\omega)T} - 1}{a + j\omega}$$

$$(c) \quad X(\omega) = j \sin(\omega) \frac{4\pi}{4\pi^2 - \omega^2}$$

6.2 Ans) ㉠ ㉡

6.3 Ans)

$$(a) \quad x(t) = \frac{2}{t}(\sin 3t - \sin t)$$

$$(b) \quad x(t) = \frac{1}{\pi t}(\sin 2t + \sin t)$$

$$(c) \quad x(t) = \left[\text{sinc}\left(\frac{1}{2}(t+1)\right) + \text{sinc}\left(\frac{1}{2}(t-1)\right) \right]$$

6.4 Ans)

$$(a) \quad X(\omega) = \frac{2e^{-j2\omega}}{\omega} \sin(2\omega)$$

$$(b) \quad X(\omega) = \frac{1}{j\omega + 2}(1 - e^{-4(j\omega + 2)})$$

$$(c) \quad X(\omega) = \frac{e^{-j4\omega}(1 + j4\omega) - 1}{\omega^2}$$

6.5 Ans)

$$(a) \quad X(\omega) = j\frac{\pi}{2}[\delta(\omega + \omega_0) - \delta(\omega - \omega_0)] - \frac{\omega_0}{\omega^2 - \omega_0^2}$$

$$(b) \quad X(\omega) = \frac{\omega}{\omega - j\pi}$$

$$(c) \quad X(\omega) = \frac{\omega_0}{\omega_0^2 - (\omega - j\pi)^2} = \frac{\omega_0}{j2\pi\omega + \omega_0^2 - \omega^2 + \pi^2}$$

6.6 Ans)

$$(a) \quad x(t) = u(t+1) - 2u(t) + u(t-1), \quad X(\omega) = \frac{2}{j\omega}(\cos\omega - 1)$$

$$(b) \quad \frac{dx(t)}{dt} = \delta(t-1) - 2\delta(t) + \delta(t+1), \quad X(\omega) = \frac{e^{j\omega} + e^{-j\omega}}{j\omega} - \frac{2}{j\omega} = \frac{2}{j\omega}(\cos\omega - 1)$$

6.7 Ans)

$$(a) X_1(\omega) = \frac{1}{2 + j\omega}$$

$$(b) X_2(\omega) = \frac{e^{-j2\omega}}{3 + j\omega}$$

$$(c) X_3(\omega) = \frac{e^{-j2\omega}}{1 - \omega^2 + j2\omega}$$

$$(d) X_4(\omega) = \frac{1}{2(\omega + 2\pi) - j2} - \frac{1}{2(\omega - 2\pi) - j2}$$

6.8 Ans)

$$(a) x(t) = \frac{1}{2}[\text{rect}(\frac{t+2}{2}) + \text{rect}(\frac{t-2}{2})]$$

$$(b) x(t) = \frac{a}{\pi(a^2 + t^2)}$$

$$(c) x(t) = \text{rect}(\frac{t}{2}) \cos \omega_0 t$$

$$(d) x(t) = \frac{1}{\pi t}$$

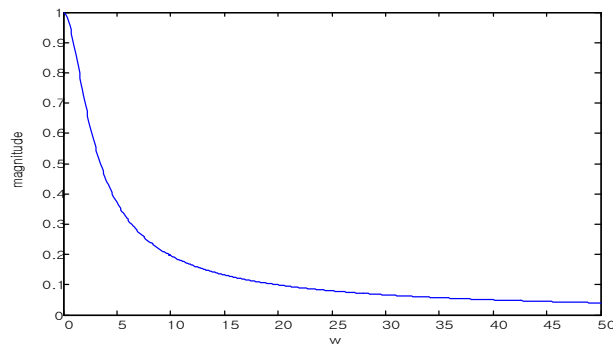
6.9 Ans)

$$(a) E = \pi$$

$$(b) E = \frac{8\pi}{3}$$

6.10 Ans)

$$(a) H(\omega) = \frac{Y(\omega)}{X(\omega)} = \frac{2}{j\omega + 2}, \text{ 저역 통과 필터}$$



$$(b) h(t) = 2e^{-2t}u(t)$$

$$(c) y(t) = 2e^{-2t}u(t) - 2e^{-3t}u(t)$$

[응용 문제]

6.11 Ans)

$$(a) \quad X_1(\omega) = \frac{1}{\omega^2} [e^{-j\omega} + j\omega e^{-j\omega} - 1]$$

$$(b) \quad X_2(\omega) = \frac{1}{2} \text{sinc}^2\left(\frac{\omega}{2\pi}\right)$$

$$(c) \quad X_3(\omega) = 2 \text{sinc}\left(\frac{\omega}{\pi}\right)$$

6.12 Ans)

$$(a) \quad Y(\omega) = j \frac{1}{2} (\delta(\omega + 2) - \delta(\omega - 2))$$

$$(b) \quad Y(\omega) = e^{j\omega} \left(j [\delta(\omega + 1) - \delta(\omega - 1)] - 2 \text{rect}\left(\frac{\omega}{2}\right) \right)$$

$$(c) \quad Y(\omega) = \text{rect}\left(\frac{\omega}{2}\right) e^{-j2\omega}$$

$$(d) \quad Y(\omega) = \frac{1}{j\omega} \text{rect}\left(\frac{\omega}{2}\right) + \pi \delta(\omega)$$

6.13 Ans)

$$(a) \quad x(t) = \frac{1}{\pi} \text{sinc}\left(\frac{t}{\pi} - \frac{1}{2}\right)$$

$$(b) \quad x(t) = \frac{1 - \cos t}{\pi t}$$

6.14 Ans)

$$(a) \quad x(t) = t e^{-at} u(t)$$

$$(b) \quad v(t) = e^{-at} u(t), \quad x(t) = t v(t) = t e^{-at} u(t)$$

6.15 Ans)

$$(a) \quad h_{LP}(t) = 200 \text{sinc}(200t)$$

$$(b) \quad h_{BP}(t) = 400 \text{sinc}(200t) \cos(2000\pi t)$$