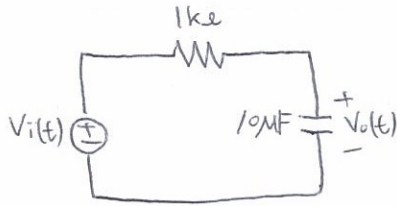


* 다음 회로에 대하여 답하시오.

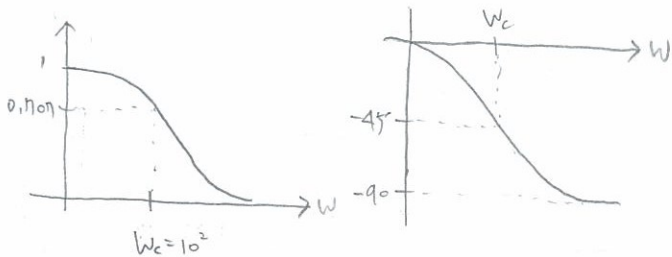


34) 전달함수 $H(s) = \frac{V_o(s)}{V_i(s)}$ 을 구하시오.

$$V_o(s) = V_i(s) \cdot \frac{\frac{10^5}{s}}{10^3 + \frac{10^5}{s}}$$

$$\therefore H(s) = \frac{10^2}{s + 10^2}$$

35) 진폭특성곡선과 위상특성곡선을 그리시오.

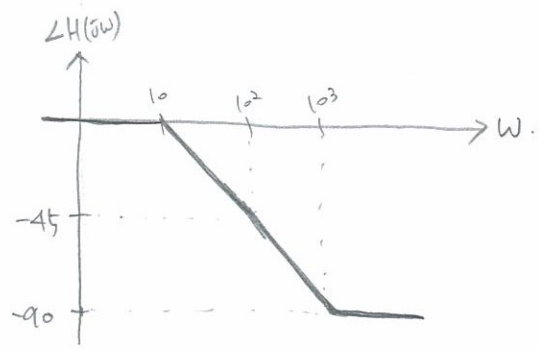
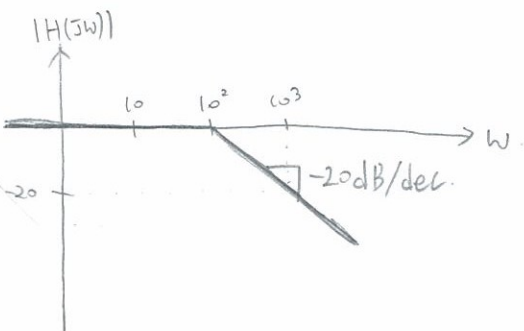


36) 이 회로의 주파수 특성은?

$$H(0) = 1, H(\infty) = 0 \Rightarrow \text{저역통과필터 (LPF)}$$

37) Bode Plots을 그리시오.

$$H(s) = \frac{1}{\frac{s}{10^2} + 1}$$

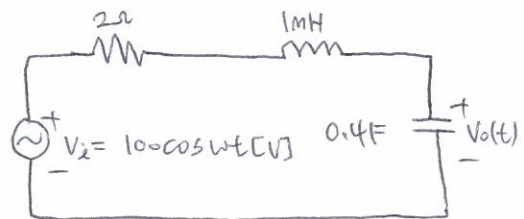


38) 차단주파수 ω_c 와 대역폭 BW를 구하시오.

$$\omega_c = \frac{1}{RC} = 100$$

$$BW = \frac{1}{RC} = 100$$

* 다음 회로에 대하여 답하시오.



39) 전달함수 $H(s)$ 를 구하시오.

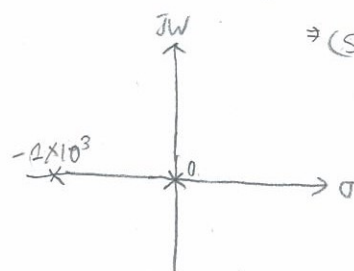
$$\begin{aligned} V_o(s) &= V_i(s) \cdot \frac{\frac{2.5}{s}}{2 + 10^{-3}s + \frac{2.5}{s}} \\ &= V_i(s) \cdot \frac{2.5}{10^{-3}s^2 + 2s + 2.5} \\ &= V_i(s) \cdot \frac{2.5 \times 10^3}{s^2 + 2 \times 10^3 s + 2.5 \times 10^3} \\ \therefore H(s) &= \frac{10^4}{4s^2 + 8 \times 10^3 s + 10^4} \end{aligned}$$

40) 극점과 영점의 분포를 그리시오.

$$\text{영점} \Rightarrow \text{분해} \times, \text{극점} \Rightarrow s^2 + 2 \times 10^3 s + 2.5 \times 10^3 = 0$$

$$\Rightarrow (s + 10^3)^2 + 2.5 \times 10^3 - 10^6 = 0$$

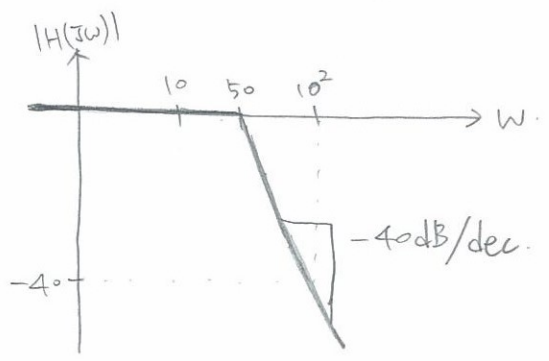
$$s = -10^3 \pm j10^3$$



㉑ 진폭특성을 나타내는 Bode Plot을 그리시오.

$$H(s) = \frac{1}{(1 + \frac{s}{50})^2 + 0.16s}$$

$$|H(j\omega)| = -20 \log \left| 1 + \left(\frac{\omega}{50} \right)^2 \right|$$



㉒ 어떤 종류의 필터인가?

$$H(0) = 1, H(\infty) = 0 \Rightarrow \text{저역통과필터 (LPF)}$$

㉓ 공진주파수와 대역폭 BW를 구하시오.

$$\omega_0 = \frac{1}{\sqrt{LC}} = 50$$

$$BW = \frac{R}{L} = 2000$$

㉔ 반전력 주파수는?

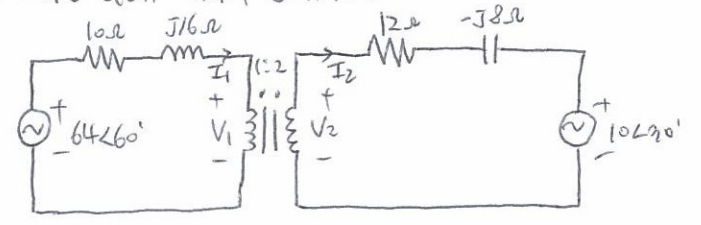
$$\omega_1 = \omega_0 - \frac{BW}{2} = -950$$

$$\omega_2 = \omega_0 + \frac{BW}{2} = 1050$$

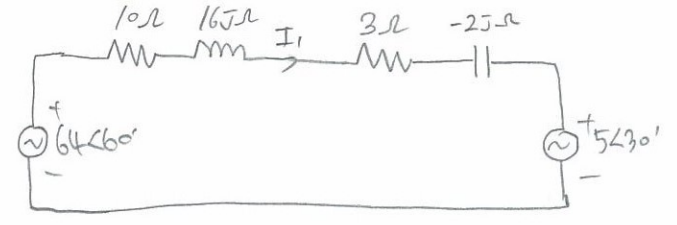
㉕ Quality factor Q를 구하시오.

$$Q = \frac{\omega_0}{BW} = 0.025$$

* 다음 회로에 대하여 답하시오.



㉖ 1차원으로 환상한 등가회로를 그리시오.



㉗ I1을 구하시오.

$$I_1 = \frac{64\angle 60^\circ - 5\angle 30^\circ}{13 + 14j} = 3.02 + 0.924j = 3.13 \angle 15.28^\circ \text{ [A]}$$

㉘ I2를 구하시오.

$$I_2 = \frac{1}{2} I_1 = 1.56 \angle 15.28^\circ \text{ [A]}$$

㉙ V1을 구하시오.

$$V_1 = (3 - 2j) I_1 + 5\angle 30^\circ = 15.1 \angle -4.05^\circ \text{ [V]}$$

㉚ V2를 구하시오.

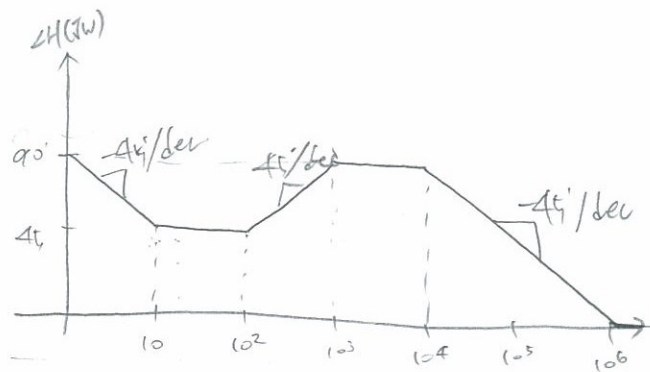
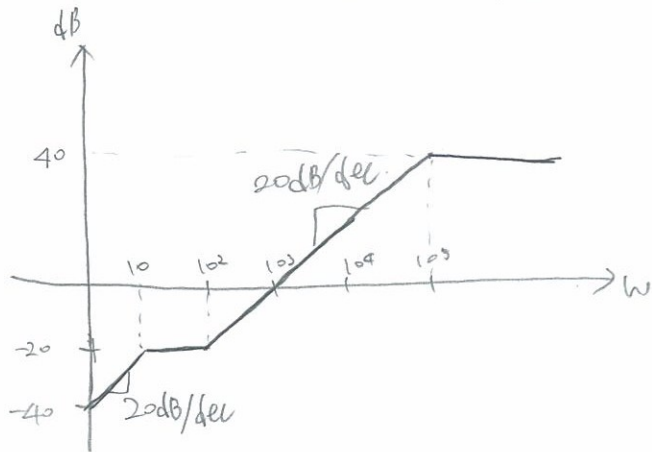
$$V_2 = 2V_1 = 30.2 \angle -4.05^\circ \text{ [V]}$$

* $H(s) = \frac{10^2 s (s + 10^2)}{(s + 10)(s + 10^5)}$ 의 Bode plot을 그리시오.

$$\begin{aligned} H(s) &= \frac{10^2 \cdot 10^2 s \left(\frac{s}{10^2} + 1 \right)}{10 \cdot 10^5 \left(\frac{s}{10} + 1 \right) \left(\frac{s}{10^5} + 1 \right)} \\ &= \frac{s \left(\frac{s}{10^2} + 1 \right)}{10^2 \left(\frac{s}{10} + 1 \right) \left(\frac{s}{10^5} + 1 \right)} \end{aligned}$$

$$|H(j\omega)|_{dB} = 20 \log \omega + 20 \log \left| 1 + \frac{\omega}{10} \right| - 40 - 20 \log \left| 1 + \frac{\omega}{10} \right| - 20 \log \left| 1 + \frac{\omega}{10^5} \right|$$

$$\angle H(j\omega) = 90^\circ + \tan^{-1}\left(\frac{\omega}{10}\right) - \tan^{-1}\left(\frac{\omega}{10}\right) - \tan^{-1}\left(\frac{\omega}{10^5}\right)$$

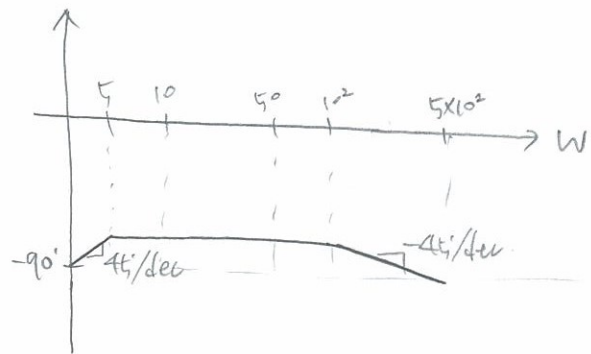
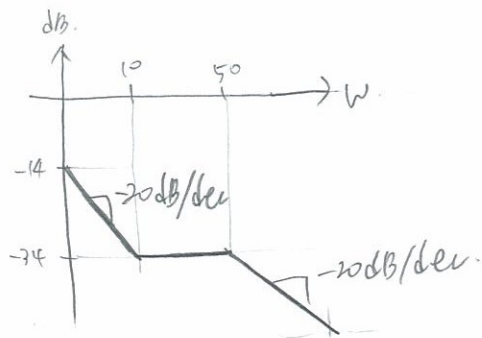


* $H(s) = \frac{s+10}{s(s+50)}$ 의 Bode plot을 그리시오.

$$H(s) = \frac{10 \left(\frac{s}{10} + 1 \right)}{50 s \left(\frac{s}{50} + 1 \right)}$$

$$|H(j\omega)|_{dB} = \underbrace{20 \log \frac{1}{5}}_{-14} + 20 \log \left| 1 + \frac{\omega}{10} \right| - 20 \log \omega - 20 \log \left| 1 + \frac{\omega}{50} \right|$$

$$\angle H(j\omega) = -90^\circ - \tan^{-1}\left(\frac{\omega}{50}\right) + \tan\left(\frac{\omega}{10}\right)$$



* Bode 크기 성질과 다음과 같을 때, 전달함수 $H(s)$ 를 구하시오. (5), (6) $\Rightarrow$ 20이 3배로 14번 증가.

* Bode 크기 성질과 다음과 같을 때, 전달함수 $H(s)$ 를 구하시오. (7), (8).

$$H(s) = \frac{10(1+s)}{s\left(\frac{s}{5}+1\right)}$$

$$\therefore H(s) = \frac{50(1+s)}{s(s+5)}$$

* $V(t) = 2 + \sqrt{2} \cos 2t + 5 \cos 4t$ [V]의 실효전압을?

$$V_{dc} = 2, \quad a_n = \sqrt{2}, \quad b_n = 5$$

$$V_{rms}^2 = V_{dc}^2 + \frac{1}{2} \sum_{n=1}^{\infty} (a_n^2 + b_n^2)$$

$$= 4 + \frac{1}{2} (2 + 25) = 13.5$$

$$\therefore V_{rms} = \sqrt{13.5} = 3.67 [V]$$