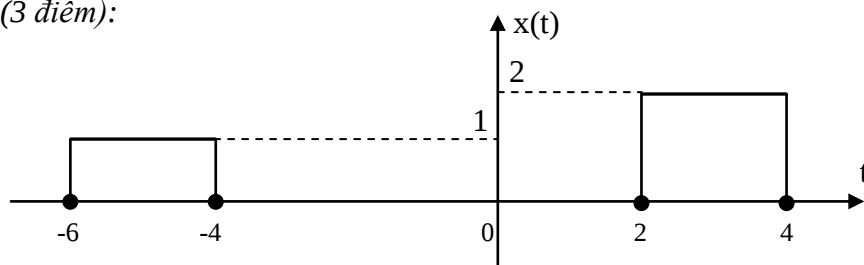


Câu 1 (3 điểm):



(0,5)

$$TH1: 0 \leq \tau \leq 2: \quad \varphi_{xx}(\tau) = \int_{-6+\tau}^{-4} dt + \int_{2+\tau}^4 4dt = 10 - 5\tau$$

(0,5)

$$TH2: 6 \leq \tau \leq 8: \quad \varphi_{xx}(\tau) = \int_{-4+\tau}^{-4} 2dt = 2(\tau - 6)$$

(0,5)

$$TH3: 8 \leq \tau \leq 10: \quad \varphi_{xx}(\tau) = \int_{-6+\tau}^4 2dt = 2(10 - \tau)$$

(0,5)

$$TH4: \varphi_{xx}(\tau) = 0 \quad \forall \tau > 0 \text{ khác}$$

Vì $x(t)$ là tín hiệu thực nên $\varphi_{xx}(\tau) = \varphi_{xx}(-\tau)$

$$\varphi_{xx}(\tau) = \begin{cases} 10-5|\tau| & \text{ khi } 0 \leq |\tau| \leq 2 \\ 2(|\tau|-6) & \text{ khi } 6 \leq |\tau| \leq 8 \\ 2(10-|\tau|) & \text{ khi } 8 \leq |\tau| \leq 10 \\ 0 & \forall \tau \text{ khác} \end{cases}$$

(0,5)

$$E_x = \varphi_{xx}(0) = 10 \text{ đvnl}$$

(0,5)

Câu 2 (2 điểm):

$$X(s) = \frac{3}{s^2 + 9} \quad (0,5) \quad H(s) = \frac{1}{s+1} \quad (0,5)$$

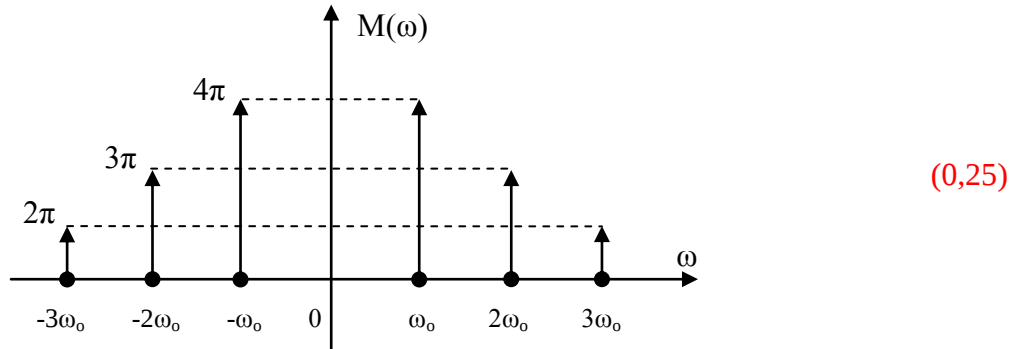
$$Y(s) = X(s)H(s) = \frac{3}{(s^2 + 9)(s+1)} \quad (0,25)$$

$$Y(s) = \frac{3/10}{s+1} + \frac{-3s/10}{s^2 + 9} + \frac{3/10}{s^2 + 9} \quad (0,5)$$

$$y(t) = \frac{3}{10}e^{-t}u(t) - \frac{3}{10}\cos(3t)u(t) + \frac{1}{10}\sin(3t)u(t) \quad (0,25)$$

Câu 3 (5 điểm):

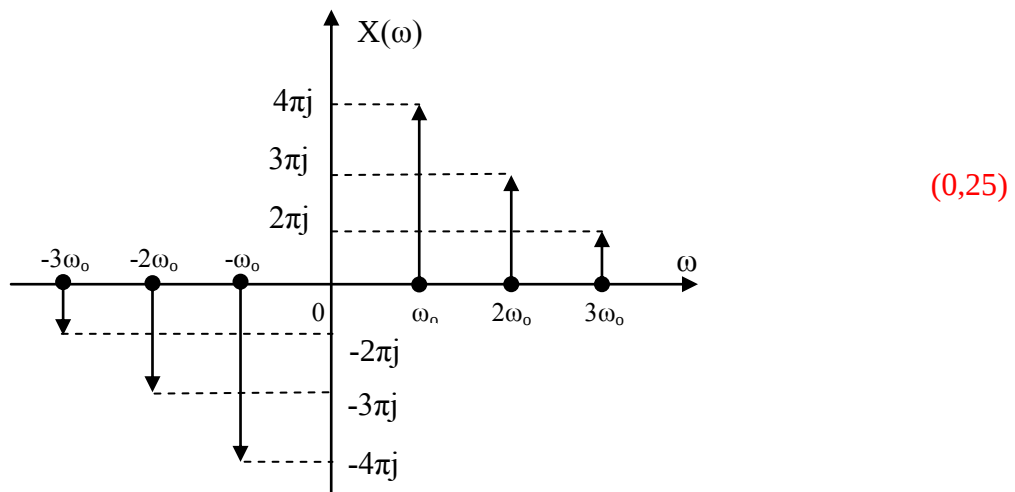
$$M(\omega) = 4\pi[\delta(\omega - \omega_0) + \delta(\omega + \omega_0)] + 3\pi[\delta(\omega - 2\omega_0) + \delta(\omega + 2\omega_0)] + 2\pi[\delta(\omega - 3\omega_0) + \delta(\omega + 3\omega_0)] \quad (0,5)$$



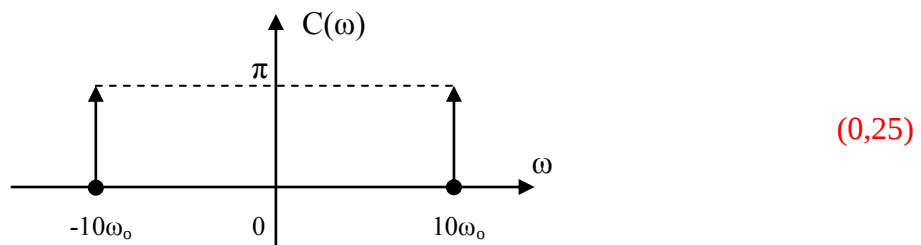
$$\psi_M(\omega) = 2\pi 4[\delta(\omega - \omega_0) + \delta(\omega + \omega_0)] + 2\pi \frac{9}{4}[\delta(\omega - 2\omega_0) + \delta(\omega + 2\omega_0)] + 2\pi[\delta(\omega - 3\omega_0) + \delta(\omega + 3\omega_0)] \quad (0,25)$$

$$P_M = \frac{29}{2} \text{ đvcs} \quad (0,25)$$

$$X(\omega) = M(\omega).H(\omega) = 4\pi j[\delta(\omega - \omega_0) - \delta(\omega + \omega_0)] + 3\pi j[\delta(\omega - 2\omega_0) - \delta(\omega + 2\omega_0)] + 2\pi j[\delta(\omega - 3\omega_0) - \delta(\omega + 3\omega_0)] \quad (0,25)$$



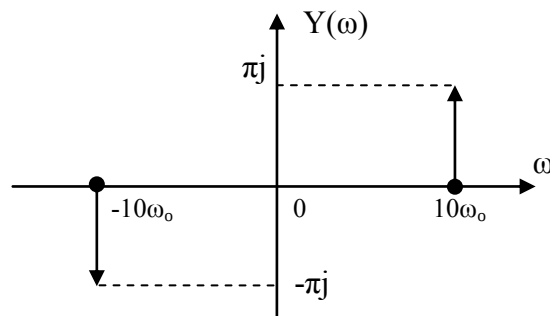
$$C(\omega) = \pi[\delta(\omega - 10\omega_0) + \delta(\omega + 10\omega_0)] \quad (0,25)$$



$$Y(\omega) = C(\omega).H(\omega) = \pi j[\delta(\omega - 10\omega_0) - \delta(\omega + 10\omega_0)]$$

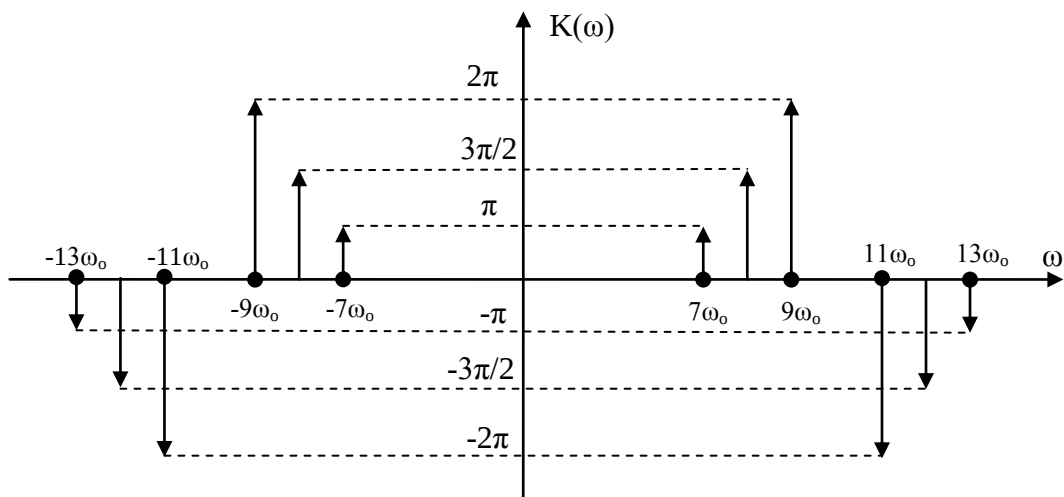
$$\rightarrow y(t) = -\sin(10\omega_0 t)$$

(0,25)



(0,25)

$$K(\omega) = \frac{-1}{2j} [X(\omega - 10\omega_0) - X(\omega + 10\omega_0)]$$



(0,25)

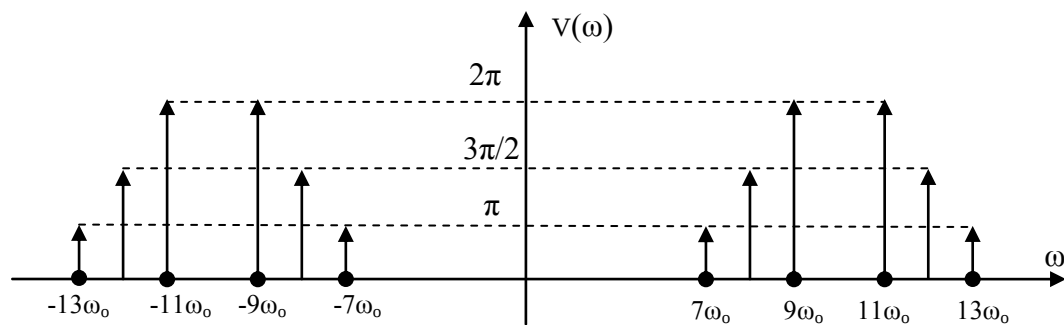
$$K(\omega) = \pi[\delta(\omega - 7\omega_0) + \delta(\omega + 7\omega_0)] + \frac{3}{2}\pi[\delta(\omega - 8\omega_0) + \delta(\omega + 8\omega_0)]$$

$$+ 2\pi[\delta(\omega - 9\omega_0) + \delta(\omega + 9\omega_0)] - 2\pi[\delta(\omega - 11\omega_0) + \delta(\omega + 11\omega_0)]$$

$$- \frac{3}{2}\pi[\delta(\omega - 12\omega_0) + \delta(\omega + 12\omega_0)] - \pi[\delta(\omega - 13\omega_0) + \delta(\omega + 13\omega_0)]$$

(0,25)

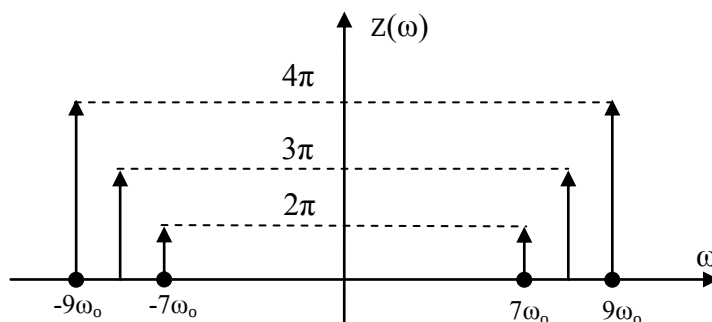
$$V(\omega) = \frac{1}{2}[M(\omega - 10\omega_0) + M(\omega + 10\omega_0)]$$



(0,25)

$$\begin{aligned}
 V(\omega) &= \pi[\delta(\omega - 7\omega_0) + \delta(\omega + 7\omega_0)] + \frac{3}{2}\pi[\delta(\omega - 8\omega_0) + \delta(\omega + 8\omega_0)] \\
 &+ 2\pi[\delta(\omega - 9\omega_0) + \delta(\omega + 9\omega_0)] + 2\pi[\delta(\omega - 11\omega_0) + \delta(\omega + 11\omega_0)] \\
 &+ \frac{3}{2}\pi[\delta(\omega - 12\omega_0) + \delta(\omega + 12\omega_0)] + \pi[\delta(\omega - 13\omega_0) + \delta(\omega + 13\omega_0)]
 \end{aligned}
 \quad (0,25)$$

$$\begin{aligned}
 Z(\omega) &= V(\omega) + K(\omega) = 4\pi[\delta(\omega - 9\omega_0) + \delta(\omega + 9\omega_0)] \\
 &+ 3\pi[\delta(\omega - 8\omega_0) + \delta(\omega + 8\omega_0)] + 2\pi[\delta(\omega - 7\omega_0) + \delta(\omega + 7\omega_0)]
 \end{aligned}
 \quad (0,25)$$



$$z(t) = 2\cos(7\omega_0 t) + 3\cos(8\omega_0 t) + 4\cos(9\omega_0 t) \quad (0,25)$$

$$\begin{aligned}
 \psi_Z(\omega) &= 2\pi 4[\delta(\omega - 9\omega_0) + \delta(\omega + 9\omega_0)] + 2\pi \frac{9}{4}[\delta(\omega - 8\omega_0) + \delta(\omega + 8\omega_0)] \\
 &+ 2\pi[\delta(\omega - 7\omega_0) + \delta(\omega + 7\omega_0)]
 \end{aligned}
 \quad (0,25)$$

$$P_Z = \frac{29}{2} \text{ đvcs} \quad (0,25)$$

TRƯỞNG NGÀNH

Tp. HCM, ngày 01 tháng 01 năm 2015
GIẢNG VIÊN RA ĐỀ

Th.S Nguyễn Ngô Lâm

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