Problem 11.13

Sketch the magnitude characteristic of the bode plot for the transfer function.

$$H(jw) = \frac{100(jw)}{(jw+1)(jw+10)(jw+50)}$$

Suggested Solution

$$H(jw) = \frac{\frac{1}{S}(jw)}{(jw+1)(\frac{jw}{10}+1)(\frac{jw}{50}+1)}$$

Problem 11.18

Sketch the magnitude characteristic of the bode plot for the transfer function.

$$H(j\omega) = \frac{100(j\omega)^2}{(j\omega+1)(j\omega+10)^2(j\omega+50)}$$

Suggested Solution

$$H(j\omega) = \frac{100(j\omega)^2}{(j\omega+1)(j\omega+10)^2(j\omega+50)}$$

$$H(j\omega) = \frac{(1/50)(j\omega)^2}{(j\omega+1)(0.1j\omega+1)^2(0.02j\omega+1)}$$

poles :1, 50 and 2@ 10 r/s

zeros: 2 @ dc

also: 1/50 = - 34 dB

Problem 11.29

Find H(jw) if its amplitude characteristic is shown in fig 29.

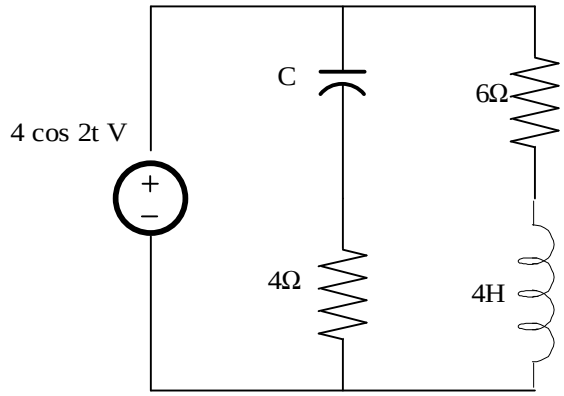
Suggested Solution

The initial slope of –20dB/dec will cut the odB line at w=40r/s. Therefore the gain is 40. The zeros are at w=50r/s and w=1000r/s. The pole are ar w=0 and there is a double pole at w=400.:

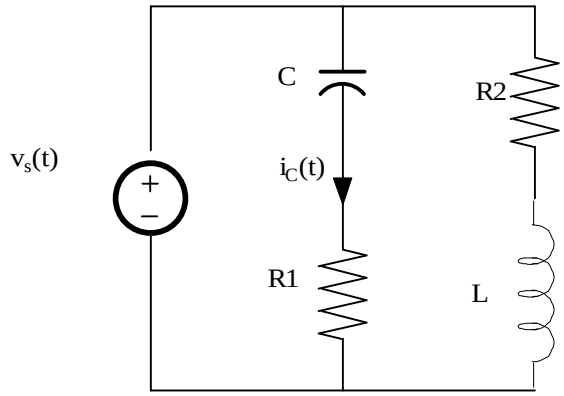
$$H(j\omega) = \frac{40(\frac{j\omega}{50}+1)(\frac{j\omega}{1000}+1)}{j\omega(\frac{j\omega}{100}+1)^2}$$

Problem 11.50

Determine the value of C in the network shown in fig 11.50 in order for the circuit to be in resonance.



Suggested Solution



AT RESONANCE Vs(t) AND Is(t) ARE IN PHASE.
SO, THE IMPEDANCE SEEN BY THE SOURCE, Zs, IS PURELY RESISTIVE.

$$Z_S = \left(R_1 + \frac{1}{jwc}\right) \square \left(R_2 + \frac{1}{jwL}\right) = R_{EQ} + jo$$

$$Z_S = \left(4 + \frac{1}{j2c}\right) \square (6 + j8)$$

$$Z_S = \frac{24 + \frac{4}{C} + j(32 - \frac{3}{C})}{10 + j(8 - \frac{1}{2C})} = \frac{N(jw)}{D(jw)} = R_{eq}$$

IF Zs IS RESISTIVE, THEN THE PHASE ANGLES OF N(jw) AND D(jw) MUST BE EQUAL.

$$\frac{32 - 3/C}{24 + 4/C} \Rightarrow 64C^2 - 25C + 1 = 0 \Rightarrow C = 45.2mF, 345.4mF$$