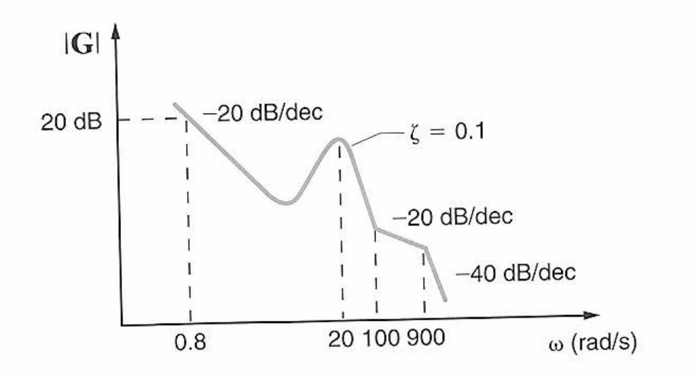
Problem 11.33

Find G(jw) if the amplitude characteristic fir this function is shown in fig 11.33.



Suggested Solution

Zeros: 2@100 r/s
Simple poles: dc $ 900 r/s
Complex poles : τ=1/20s $ ζ=0.1
So Wo=20 r/s
$ 2ξζ=0.01
Also,

$$H(j0.8) = 20dB = 10$$

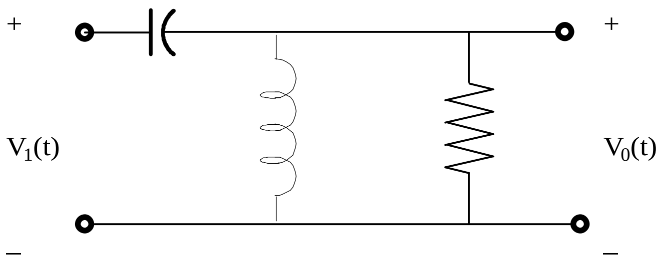
$$H(jw) = \frac{k(0.1jw+1)^2}{(jw)\left(\frac{jw}{900}+1\right)\left(\left(\frac{jw}{20}\right)^2 + \frac{jw}{100}+1\right)}$$

$$H(j0.8) = 10 \Rightarrow K = 8$$

$$H(jw) = \frac{0.8(0.1jw+1)^2}{(jw)\left(\frac{jw}{900}+1\right)\left(\left(\frac{jw}{20}\right)^2 + \frac{jw}{100}+1\right)}$$

Problem 11.54

Given the network in fig 11.54 sketch the magnitude characteristic of the transfer function.



Suggested Solution

$$Z_{EQ} = jwL \parallel (R) = \frac{jwL}{1 + jwL/R}$$

$$G_V(jw) = \frac{V_O}{V_1} = \frac{Z_{EQ}}{Z_{EQ} + jwL/C} = \frac{jwL}{jwL + \frac{1}{jWC}[jwL/R]}$$

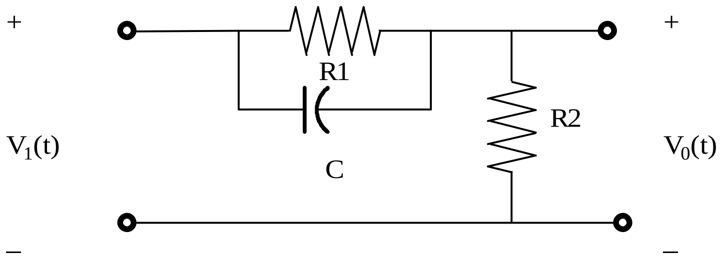
$$G_V(jw) = \frac{(jw)^2}{(jw)^2 + 10jw + 100}$$

FIND FORM, $$G_V(jw) = \frac{0.01(jw)^2}{(\frac{jw}{10})^2 + \frac{jw}{10} + 1}$$

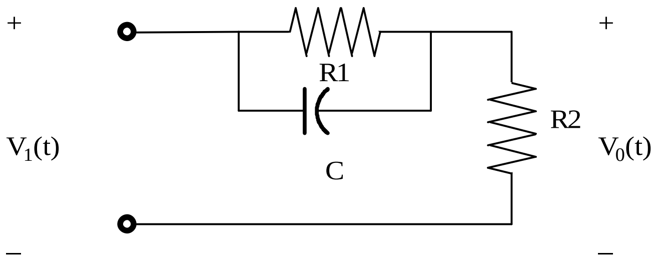
NETWORK IS A HIGHPASS FILTER.

Problem 11.57

Determine what type of filter the network shown in fig 11.57 represents by determining the voltage transfer function.



Suggested Solution



$$Z_{EQ} = R_1 \parallel \frac{1}{jwL} = \frac{jwLR_1}{R_1 + jwL}$$

$$G_V = \frac{V_O}{V_i} = \frac{R_2}{R_2 + Z_{EQ}} = \frac{(R_1 + jwL)R_2}{R_1R_2 + jwLR_1 + jwLR_1}$$

$$G_V = \frac{1 + \frac{jwL}{R_1}}{1 + \frac{jwL}{R}}$$

$$R = R_1 \parallel R_2 < R_1$$

$$W_Z = \frac{R_1}{L}$$

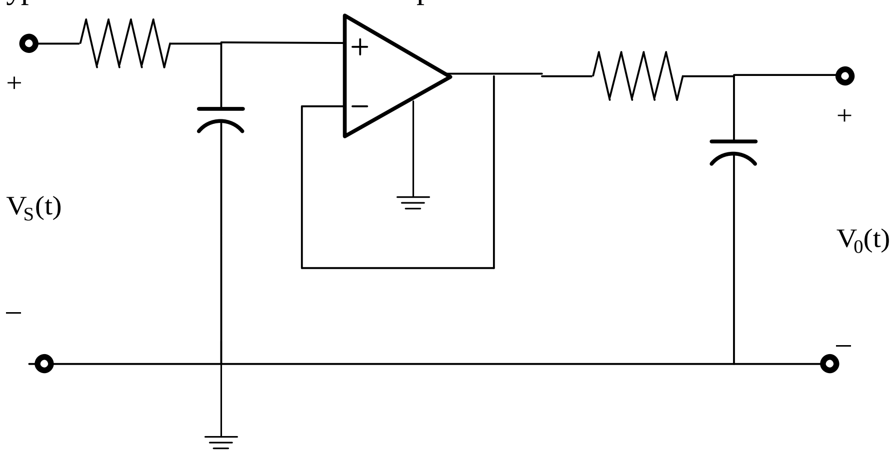
$$W_P = \frac{R}{L}$$

$$W_P < W_Z$$

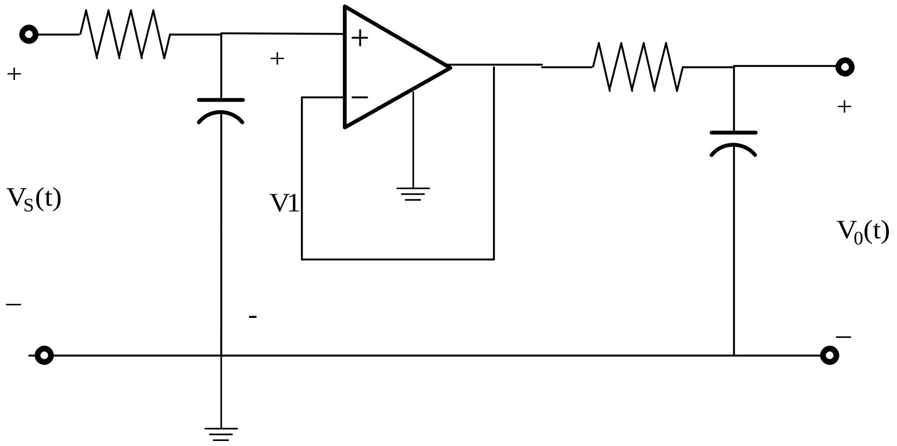
NETWORK IS A LOW-PASS FILTER.

Problem 11.59

Given the network shown in fig 11.59 and employing the voltage follower analyzed in chapter 3 determine the voltage transfer function and its magnitude characteristic. What type of filter does the network represent?



Suggested Solution



$R = 1\Omega$

$C = 1F$

$$\frac{V_1}{V_i} = \frac{1/jw}{(1/jw)+1} = \frac{1}{1+jw}$$

$$\frac{V_O}{V_1} = \left(\frac{1}{1+jw}\right)^2$$

SECOND ORDER LOW-PASS