

King Fahd University of Petroleum & Minerals
Electrical Engineering Department
EE205: Electric Circuits II (031)

Quiz 6

Name: KEY

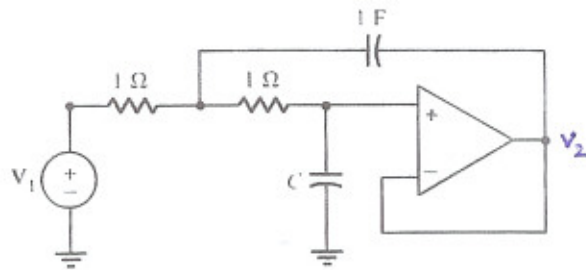
ID#

Sec 02

For the op-amp circuit given in the figure, find the Transfer function

$H(s) = V_2 / V_1$ and draw the pole-zero

plot for the case that $C = \frac{1}{5} F$

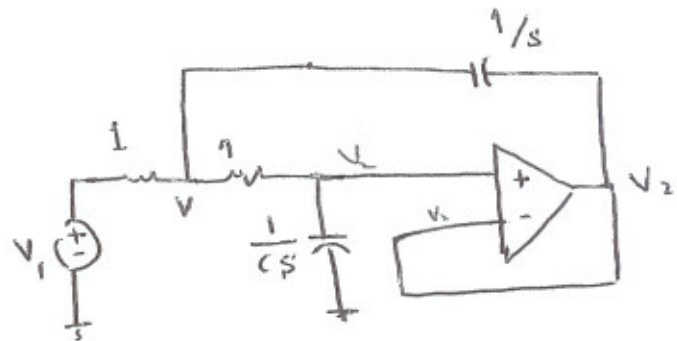


By KCL at node v

$$\frac{V - V_1}{1} + \frac{V - V_2}{1} + \frac{V - V_2}{1/s} = 0$$

$$V - V_1 + V - V_2 + s(V - V_2) = 0$$

$$(s+2)V - V_1 - (s+1)V_2 = 0$$



By KCL at node v_2 (voltage divider)

$$V_2 = \frac{1/s}{1/s + 1} v = \frac{1}{1 + Cs} v \Rightarrow v = (1 + Cs) V_2$$

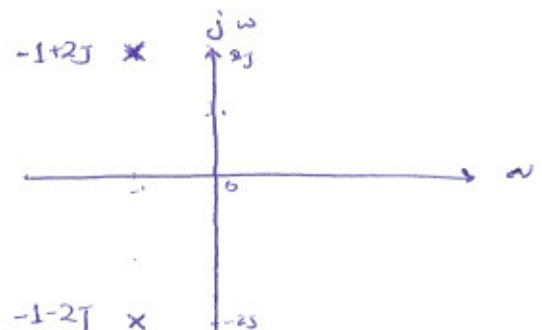
$$\Rightarrow (s+2)(Cs+1)V_2 - (s+1)V_2 = V_1$$

$$(Cs^2 + 2Cs + s + 2 - s - 1)V_2 = V_1 \Rightarrow H(s) = \frac{V_2}{V_1} = \frac{1}{Cs^2 + 2Cs + 1} = \frac{1/C}{s^2 + 2s + 1/C}$$

$$C = \frac{1}{5} \Rightarrow H(s) = \frac{5}{s^2 + 2s + 5}$$

No zeros. poles.

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-2 \pm \sqrt{4 - 20}}{2} = -1 \pm j2$$



Good Luck,
Dr. Ali Muqaibel