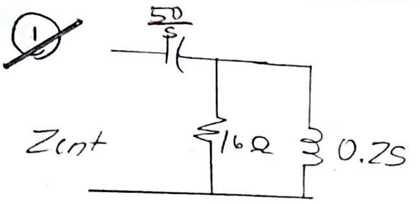
1



$$Z_1(s) = \frac{(16)(0.2s)}{16+0.2s}$$

$$Z_1(s) = \frac{3.2s}{16+0.2s}$$

$$Zint(s) = \frac{50}{s} + Z_1(s)$$

$$= \frac{50}{s} + \frac{3.2s}{16+0.2s}$$

$$= \frac{50(16+0.2s)+3.2s^2}{s(16+0.2s)}$$

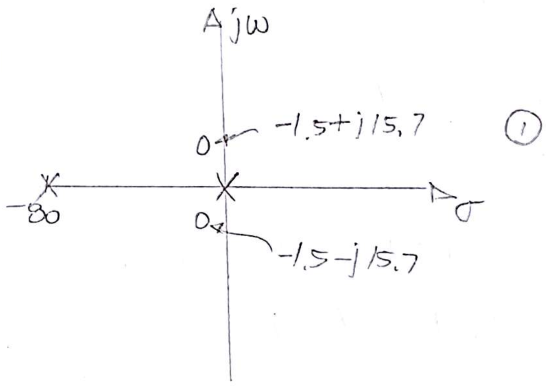
$$= \frac{800+10s+3.2s^2}{s(16+0.2s)} \quad (3)$$

b) POLOS: $s=0$, $s = -\frac{16}{0.2} = -80$ (1)

CEROS: $s = \frac{-10 \pm \sqrt{10^2-4(3.2)(800)}}{2(3.2)}$ (1)

$$s = \frac{-10 \pm j\,100.698}{6.4}$$

$$s = -1.5625 \pm j\,15.734$$



c) $Z(j8) = \frac{800+10(j8)+3.2(j8)^2}{j8(16+0.2*j8)}$ (2)

$$= \frac{800+j80-204.8}{j128-12.8} = \frac{595.2-j80}{j128-12.8} = \frac{600.552\angle -7.65517^\circ}{128.638\angle 174.289^\circ}$$

$$= 4.668\angle -181.945^\circ$$

$$= -j4.6658 + 0.1584$$

d) $Z_1(s) = \dfrac{(R)(0.2s)}{R+0.2s}$

$$Z_1(s) = \frac{50}{s} + \frac{R(0.2s)}{R+0.2s}$$

$$= \frac{50(R+0.2s)+Rs^2(0.2)}{s(R+0.2s)}$$

$$0 = \frac{50(R+0.2*(-5))+R(-5)^2(0.2)}{(-5)(R+0.2(-5))}$$

$$0 = \frac{50(R-1)+R(5)}{-5(R-1)}$$

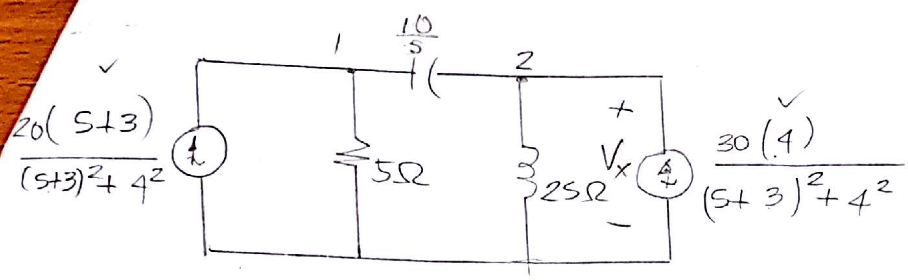
2

$$50(R-1)+R(5)=0$$

$$50R-50+5R=0$$

$$55R=50$$

$$R=0.909\ \Omega$$



$$Y_C(s) = \frac{1}{\frac{10}{s}} = \frac{s}{10}$$

NODO	V_1	V_2	ΣI
1	$\frac{1}{5}+\frac{s}{10}$	$-\frac{s}{10}$	$\frac{20(s+3)}{(s+3)^2+4^2}$
2	$-\frac{s}{10}$	$\frac{s}{10}+\frac{1}{25}$	$\frac{30(4)}{(s+3)^2+4^2}$

$$D_{V_2} = \begin{vmatrix} \frac{1}{5}+\frac{s}{10} & \frac{20(s+3)}{(s+3)^2+4^2} \\ -\frac{s}{10} & \frac{30(4)}{(s+3)^2+4^2} \end{vmatrix}$$

$$D_{V_2} = \left[\frac{2+s}{10}\right]\left[\frac{30(4)}{(s+3)^2+4^2}\right] + \frac{s}{10}\left[\frac{20(s+3)}{(s+3)^2+4^2}\right]$$

$$D_{V_2} = \frac{120(s+2)+20s(s+3)}{10[(s+3)^2+4^2]}$$

$$D_{V_2} = \frac{20s^2+180s+240}{10[(s+3)^2+4^2]}$$

$$D = \begin{vmatrix} \frac{1}{5}+\frac{s}{10} & -\frac{s}{10} \\ -\frac{s}{10} & \frac{s}{10}+\frac{1}{25} \end{vmatrix}$$

$$D = \left[\frac{2+s}{10}\right]\left[\frac{s^2+5}{10s}\right] - \frac{s^2}{100}$$

$$D = \frac{(s+2)(s^2+5)-s^3}{100s}$$

$$D = \frac{\cancel{s^3}+2s^2+5s+10-\cancel{s^3}}{100s}$$

$$D = \frac{2s^2+5s+10}{100s}$$

$$V_2 = \frac{D_{V_2}}{D}$$

$$V_2 = \frac{20s^2+180s+240}{10[(s+3)^2+4^2]} \cdot \frac{100s}{2s^2+5s+10}$$

$$V_2 = \frac{200s(s^2+9s+12)}{[(s+3)^2+4^2][2s^2+5s+10]}$$

$$V_2 = \frac{200s(s^2+9s+12)}{2[(s+3)^2+4^2][s^2+2.5s+5]}$$

$$V_2 = \frac{100s(s^2+9s+12)}{[(s+3)^2+4^2][(s^2+2.5s+1.25^2)+3.4375]}$$

$$V_2 = \frac{100s(s^2+9s+12)}{[(s+3)^2+4^2][(s+1.25)^2+(\sqrt{3.4375})^2]}$$

$$V_2 = \frac{As+B}{(s+3)^2+4^2} + \frac{Cs+D}{(s+1.25)^2+(\sqrt{3.4375})^2}$$

$$100s(s^2+9s+12) = (Cs+D)\left[(s+3)^2+4^2\right] + (As+B)\left[(s+1.25)^2+\left(\sqrt{3.4375}\right)^2\right]$$

$$100s^3+900s^2+1200s = (Cs+D)\left[s^2+6s+25\right]+(As+B)\left[s^2+2.5s+5\right]$$

$$100s^3+900s^2+1200s = Cs^3+(D+6C)s^2+(6D+25C)s+25D+As^3+(B+2.5A)s^2$$
$$+(2.5B+5A)s+5B$$

$$100s^3+900s^2+1200s = (A+C)s^3+(D+6C+B+2.5A)s^2+(6D+25C+2.5B+5A)s+(25D+5B)$$

$$\begin{cases} A + C = 100 \\ 2.5A + B + 6C + D = 900 \\ 5A + 2.5B + 25C + 6D = 1200 \\ 5B + 25D = 0 \end{cases}$$

$$\Delta = \begin{vmatrix} 1 & 0 & 1 & 0 \\ 2.5 & 1 & 6 & 1 \\ 5 & 2.5 & 25 & 6 \\ 0 & 5 & 0 & 25 \end{vmatrix} = 1\begin{vmatrix} 1 & 6 & 1 \\ 2.5 & 25 & 6 \\ 5 & 0 & 25 \end{vmatrix} + 1\begin{vmatrix} 2.5 & 1 & 1 \\ 5 & 2.5 & 6 \\ 0 & 5 & 25 \end{vmatrix}$$

$$= 5(6^2-25)+25(25-6\times2.5)+2.5(2.5\times25-30)$$
$$-5(25-5)$$
$$= 286.25$$

$$A = \frac{\begin{vmatrix} 100 & 0 & 1 & 0 \\ 900 & 1 & 6 & 1 \\ 1200 & 2.5 & 25 & 6 \\ 0 & 5 & 0 & 25 \end{vmatrix}}{\Delta} = \frac{100\begin{vmatrix} 1 & 6 & 1 \\ 2.5 & 25 & 6 \\ 5 & 0 & 25 \end{vmatrix} + 1\begin{vmatrix} 900 & 1 & 1 \\ 1200 & 2.5 & 6 \\ 0 & 5 & 25 \end{vmatrix}}{\Delta}$$

$$= \left\{100\left[5(6^2-25)+25(25-6\times2.5)\right]+1\left[900(2.5\times25-30)-1200(25-5)\right]\right\}/\Delta$$
$$= (30500+5250)/\Delta$$
$$= 35750/286.25 = 124.891$$

$$B = \frac{\begin{vmatrix} 1 & 100 & 1 & 0 \\ 2.5 & 900 & 6 & 1 \\ 5 & 1200 & 25 & 6 \\ 0 & 0 & 0 & 25 \end{vmatrix}}{\Delta} = \frac{25\begin{vmatrix} 1 & 100 & 1 \\ 2.5 & 900 & 6 \\ 5 & 1200 & 25 \end{vmatrix}}{\Delta} = \frac{25\left[1(900\times25-6\times1200)-2.5(100\times25-1200)+5(100\times6-900)\right]}{\Delta}$$

$$= \left[25(15300-3250-1500)\right]/\Delta$$
$$= 263750/286.25 = 921.397$$

$$C = \frac{\begin{vmatrix} 1 & 0 & 100 & 0 \\ 2.5 & 1 & 900 & 1 \\ 5 & 2.5 & 1200 & 6 \\ 0 & 5 & 0 & 25 \end{vmatrix}}{\Delta} = \frac{1\begin{vmatrix} 1 & 900 & 1 \\ 2.5 & 1200 & 6 \\ 5 & 0 & 25 \end{vmatrix} + 100\begin{vmatrix} 2.5 & 1 & 1 \\ 5 & 2.5 & 6 \\ 0 & 5 & 25 \end{vmatrix}}{\Delta}$$

$$= \left\{5(900\times6-1200)+25(1200-2.5\times900)+100\left[2.5(2.5\times25-30)-5(25-5)\right]\right\}/\Delta$$
$$= \left[21000-26250-1875\right]/286.25$$
$$= -24.89$$

$$\frac{\begin{vmatrix} 1 & 0 & 1 & 100 \\ 2.5 & 1 & 6 & 900 \\ 5 & 2.5 & 25 & 1200 \\ 0 & 5 & 0 & 0 \end{vmatrix}}{\Delta} = \frac{5\begin{vmatrix} 1 & 1 & 100 \\ 2.5 & 6 & 900 \\ 5 & 25 & 1200 \end{vmatrix}}{\Delta}$$

$$= \{5\,[1(6\times 1200 - 900\times 25) - 1(2.5\times 1200 - 900\times 5) + 100(2.5\times 25 - 30)]\}/\Delta$$

$$= -52750/286.25$$

$$= -184.28$$

$$\therefore V_2 = \frac{As+B}{(s+3)^2+4^2} + \frac{Cs+D}{(s+1.25)^2+(\sqrt{3.4375})^2}$$

$$V_2 = \frac{124.891s + 921.397}{(s+3)^2+4^2} + \frac{-24.89s - 184.28}{(s+1.25)^2+(\sqrt{3.4375})^2}$$

$$V_2 = \frac{124.891(s+3)}{(s+3)^2+4^2} + \frac{546.724}{(s+3)^2+4^2} - \frac{24.89(s+1.25)}{(s+1.25)^2+(\sqrt{3.4375})^2} - \frac{153.168}{(s+1.25)^2+(\sqrt{3.4375})^2}$$

$$V_2 = \frac{124.891(s+3)}{(s+3)^2+4^2} + \frac{136.681(4)}{(s+3)^2+4^2} - \frac{24.89(s+1.25)}{(s+1.25)^2+(\sqrt{3.4375})^2} - \frac{82.6124(\sqrt{3.4375})}{(s+1.25)^2+(\sqrt{3.4375})^2}$$

$$\Updownarrow$$

$$v_2(t) = [124.891e^{-3t}\cos 4t + 136.681e^{-3t}\operatorname{sen} 4t - 24.89e^{-1.25t}\cos\sqrt{3.4375}\,t - 82.6124e^{-1.25t}\operatorname{sen}\sqrt{3.4375}\,t]\,u(t)\ V$$

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$$H(s) = \frac{-10^4 (s+10^2)}{(s+10^3)}$$

$$\frac{1}{R_{1A} C_{1A}} = 10^2$$

$R_{1A} = 10K$

$$C_{1A} = \frac{1}{10 \times 10^3 (10^2)}$$ (2)

$C_{1A} = 1 \mu F$

$$\frac{1}{R_{fB} C_{fB}} = 10^3$$

$R_{fB} = 10K$ (2)

$$C_{fB} = \frac{1}{(10 \times 10^3)(10^3)}$$

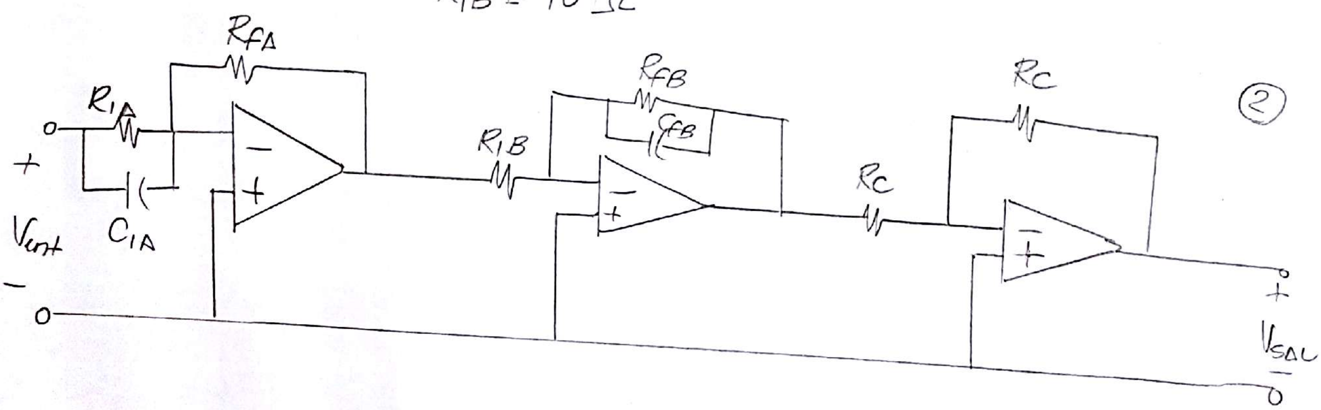
$C_{fB} = 0.1 \mu F$

$$(R_{fA} C_{1A}) \left(\frac{1}{R_{1B} C_{fB}} \right) = 10^4$$ (2)

$$(10K * 1 \times 10^{-6}) \left(\frac{1}{R_{1B} * 0.1 \times 10^{-6}} \right) = 10^4$$

$R_C = 10K\Omega$ (2)

$R_{1B} = 10 \Omega$



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