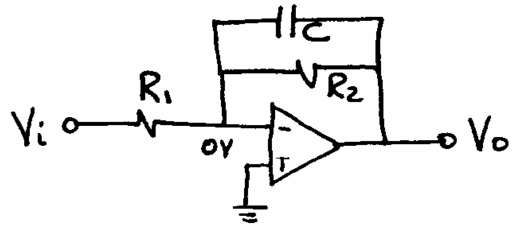
12.19

$= 10\,kHz \quad DC\ gain = 10 \quad R_{in} = 10\,k\Omega$



$R_{in} = R_1 = \underline{\underline{10\,k\Omega}}$

$C\ gain = -R_2/R_1 = -10$

$R_2 = 10R_1 = \underline{\underline{100\,k\Omega}}$

$R_2 C = 1/\omega_o$

$C = \dfrac{1}{\omega_o R_2} = \dfrac{1}{2\pi\, 10^4 \times 100\times 10^3}$

$= \underline{\underline{0.159\,nF}}$

12.40

$L = C_4 R_1 R_3 R_5 / R_2$

Choose $\underline{\underline{R_1 = R_2 = R_3 = R_5 = 10\,k\Omega}}$

$\therefore\ L = C_4 \times 10^8$

FOR:

$L = 10\,H = C_4 \times 10^8 \implies \underline{\underline{C_4 = 100\,nF}}$

$L = 1\,H \implies \underline{\underline{C_4 = 10\,nF}}$

$L = 0.1\,H \implies \underline{\underline{C_4 = 1\,nF}}$

12.44

From Fig. 12.16 (g) $\phi = 180°$ at f_o !

$\therefore$ Use $f_o = 1kHz$ $Q = 1$

$$\omega_o^2 = \frac{R_2}{C_4 C_6 R_1 R_3 R_5}$$

LET $\underline{\underline{C = C_4 = C_6 = 1nF}}$

$R_1 = R_3\ R_5 = R_2 = R$

$$= 1/C^2 R^2$$

$$R = 1/\omega_o C = \underline{\underline{159.16\ k\Omega = R_1 = R_3 = R_5 = R_2}}$$

$$\frac{\omega_o}{Q} = \frac{1}{R_6 C_6} \Rightarrow R_6 = \frac{Q}{C_4 \omega_o}$$

$$= \frac{1}{10^{-9}\, 2\pi 10^3}$$

$$\therefore \underline{\underline{R_6 = 159.16 k\Omega}}$$

12.49

$f_o = 1kHz$

The 3dB bandwidth for a 2nd order filter is given by:

$$B = \omega_o / Q \Rightarrow Q = \frac{2\pi 10^3}{2\pi 50} = \underline{\underline{20}}$$

Choose $C = 10nF$

$$R = \frac{1}{\omega_o C} = \underline{\underline{15.92\ k\Omega}}$$

Use $\underline{\underline{R_1 = R_f = 10k\Omega}}$

$$\frac{R_3}{R_2} = 2Q - 1 = 39$$

Choose $\underline{\underline{R_2 = 10k\Omega}}$ $\underline{\underline{R_3 = 390k\Omega}}$

Now $T(s) = \dfrac{-k\omega_0 s}{s^2 + s\frac{\omega_0}{Q} + \omega_0^2}$

$\Rightarrow |T(j\omega_0)| = \dfrac{k\omega_0^2}{\omega_0^2/Q} = kQ$

but $k = 2 - 1/Q = 1.95$

$\therefore$ Centre-freq gain $= kQ = \underline{\underline{39}}$