$$R_{in} = r_e \,//\, R_E$$

where $r_e = \dfrac{25\text{ mV}}{0.33\text{ mA}} = 75\ \Omega$

$$R_{in} = 75 \,//\, 3900 = \underline{\underline{73.6\ \Omega}}$$

$$R_L' \simeq R_L \,//\, R_C \,//\, r_o = 5.6 \,//\, 4.7 \qquad = 2.55\text{ k}\Omega$$

$$A_M = -\frac{R_{in}}{R_{in} + R_s} \times \frac{\alpha R_L'}{r_e}$$

$$= -\frac{73.6}{73.6 + 75} \times \frac{120}{121} \times \frac{2550}{75}$$

$$= \underline{\underline{-16.7\ \text{V/V}}}$$

$$C_\pi + C_\mu = \frac{g_m}{\omega_T} = \frac{0.33 \times 40 \times 10^{-3}}{2\pi \times 700 \times 10^{6}} = 3\ \text{pF}$$

$$C_\mu = 0.5\ \text{pF}$$

$$C_\pi = 2.5\ \text{pF}$$

Using Eq. (7.66) (suitably modified)

$$f_{P1} = \frac{1}{2\pi C_\pi (r_e \,//\, R_E \,//\, R_s)}$$

$$= \frac{1}{2\pi \times 2.5 \times 10^{-12} (75 \,//\, 3900 \,//\, 75)} = \underline{\underline{1.71\ \text{GHz}}}$$

Using Eq. (7.68) (suitably modified)

$$f_{P2} = \frac{1}{2\pi C_\mu R_L'} = \frac{1}{2\pi \times 0.5 \times 10^{-12} \times 2.55 \times 10^{3}} = \underline{\underline{1248\ \text{MHz}}}$$

$$f_H \simeq f_{P2} \simeq \underline{\underline{125\ \text{MHz}}}$$

$\boxed{1}$

$$A_M = -g_m (R_L // R_C) \frac{R_2 // R_3}{(R_2 // R_3) + R_s} \frac{r_\pi}{r_\pi + r_x + (R_2 // R_3 // R_s)}$$

where the effect of r_o has been neglected, and

$$g_m = 0.33 \times 40 = 13.2 \text{ mA/V}$$

$$r_\pi = \frac{120}{13.2} = 9 \text{ k}\Omega$$

$$A_M = -13.2\,(5.6 // 4.7) \frac{11//22}{(11//22)+5} \frac{9}{9 + 0.05 + (11//22//5)}$$

$$= \underline{\underline{-15 \text{ V/V}}}$$

The frequencies of the poles are obtained as follows:

First we determine C_π from,

$$C_\pi = \frac{g_m}{2\pi f_T} - C_\mu = \frac{13.2 \times 10^{-3}}{2\pi \times 700 \times 10^6} - 0.5 = 2.5 \text{ pF}$$

The frequency of the pole at the input is given by

$$f_{P1} = \frac{1}{2\pi R_s' (C_{\pi 1} + 2 C_{\mu 1})}$$

where $R_s' = r_{\pi 1} // [r_{x1} + (R_3 // R_2 // R_s)]$

$$= 9 // [0.05 + (22 // 11 // 5)] = 2.26 \text{ k}\Omega$$

Thus, $$f_{P1} = \frac{1}{2\pi \times 2.26 \times 10^3 (2.5 + 2 \times 0.5) \times 10^{-12}} = \underline{\underline{20.1 \text{ MHz}}}$$

The frequency of the pole at the emitter of Q_2 is

$$f_{P2} = \frac{1}{2\pi C_{\pi 2} r_{e2}} \simeq f_{T2} = \underline{\underline{700 \text{ MHz}}}$$

The frequency of the pole at the output is $\boxed{7}$

$$f_{P3} = \frac{1}{2\pi C_{\mu 2} R_L'}$$

where $R_L' = R_L // R_C = 5.6 // 4.7 = 2.56 \text{ k}\Omega$

Thus, $$f_{P3} = \frac{1}{2\pi \times 0.5 \times 10^{-12} \times 2.56 \times 10^3} = \underline{124 \text{ MHz}}$$

Using the sum-of-the-squares formula we estimate f_H as

$f_H = 1/(t_{p1} + t_{p2} + t_{p3})$