36 Refer to Eq. (7.13) (p 606)

$$R_{in} = R_1 // R_2 // (r_x + r_\pi)$$

where $R_1 = 33\ k\Omega$, $R_2 = 22\ k\Omega$, $r_x = 50$, and

$$r_\pi = \frac{\beta_0}{g_m} = \frac{120}{0.33 \times 40} = \frac{120}{13.2} = 9.09\ k\Omega$$

$$R_{in} = 33 // 22 // 9.14 = \underline{5.4\ k\Omega}$$

$$A_M = -\frac{R_{in}}{R_{in} + R_s} \frac{r_\pi}{r_\pi + r_x} g_m (R_C // R_L // r_o)$$

$$= -\frac{5.4}{5.4 + 5} \times \frac{9.09}{9.09 + 0.05} \times 13.2 \left(4.7 // 5.6 // 300\right)$$

$$= \underline{\underline{-17.3\ V/V}}$$

$$R_{C1} = R_s + [R_1 // R_2 // (r_x + r_\pi)]$$

$$= R_s + R_{in} = 10.4\ k\Omega$$

$$R_E' = R_E // \frac{r_\pi + r_x + (R_1 // R_2 // R_s)}{\beta_0 + 1}$$

$$= 3.9 // \frac{9.09 + 0.05 + (33 // 22 // 5)}{120}$$

$$= 103.6\ \Omega$$

$$R_{C2} = R_L + (R_C // r_o)$$

$$= 5.6 + (4.7 // 300) = 10.23\ k\Omega$$

7

$$\omega_L = \frac{1}{C_{C1} R_{C1}} + \frac{1}{C_E R_E'} + \frac{1}{C_{C2} R_{C2}}$$

$$= \frac{1}{10^{-6} \times 10.4 \times 10^3} + \frac{1}{10 \times 10^{-6} \times 103.6} + \frac{1}{10^{-6} \times 10.23 \times 10^3}$$

$$= 96.15 + 965.25 + 97.75$$

$$= 1159.15 \text{ rad/s}$$

$$f_L = \frac{\omega_L}{2\pi} = \underline{184.5 \text{ Hz}}$$

$$f_Z = \frac{1}{2\pi C_E R_E} = \frac{1}{2\pi \times 10 \times 10^{-6} \times 3.9 \times 10^3} = \underline{4.1 \text{ Hz}}$$