Make-Up Project

3. From the diagram, by KVL

$$I_{in} = \frac{s2C_X}{2}\left[V_{in} - V_{out}\right] = sC_X V_{in}\left[1 - H(s)\right]$$

From the formula

$$H(s) \equiv \frac{V_{out}(s)}{V_{in}(s)} = \frac{s^2\left(\frac{C_X}{C_X + C_B}\right) + s\left(\frac{G_{m5}}{C_X + C_B}\right) + \left(\frac{G_{m2}G_{m4}}{C_A(C_X + C_B)}\right)}{s^2 + s\left(\frac{G_{m3}}{C_X + C_B}\right) + \left(\frac{G_{m1}G_{m2}}{C_A(C_X + C_B)}\right)}$$

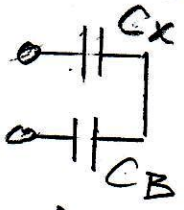
$$H(\infty) = \frac{C_X}{C_X + C_B} \quad \text{and} \quad H(0) = \frac{G_{m4}}{G_{m1}}.$$

Hence,

$$Z_{in} = \frac{V_{in}}{I_{in}} = \frac{1}{sC_X\left[1 - H(s)\right]}$$

At high frequency ($s \to \infty$)

$$Z_{in} \to \frac{C_X + C_B}{sC_X C_B}$$



At low frequency ($s \to 0$)

$$Z_{in} \to \frac{G_{m1}}{sC_X(G_{m1} - G_{m4})}$$