

$$v_o = \left( g_m v_{\pi} + \frac{v_{\pi}}{r_{\pi}'} \right) R_e = \left( 68.5 + \frac{1}{1.27} \right) 1.67 v_{\pi} = 115.7 v_{\pi}$$

$$i_i = \frac{v_{\pi}}{r_{\pi}'} = \frac{v_{\pi}}{1.27}$$

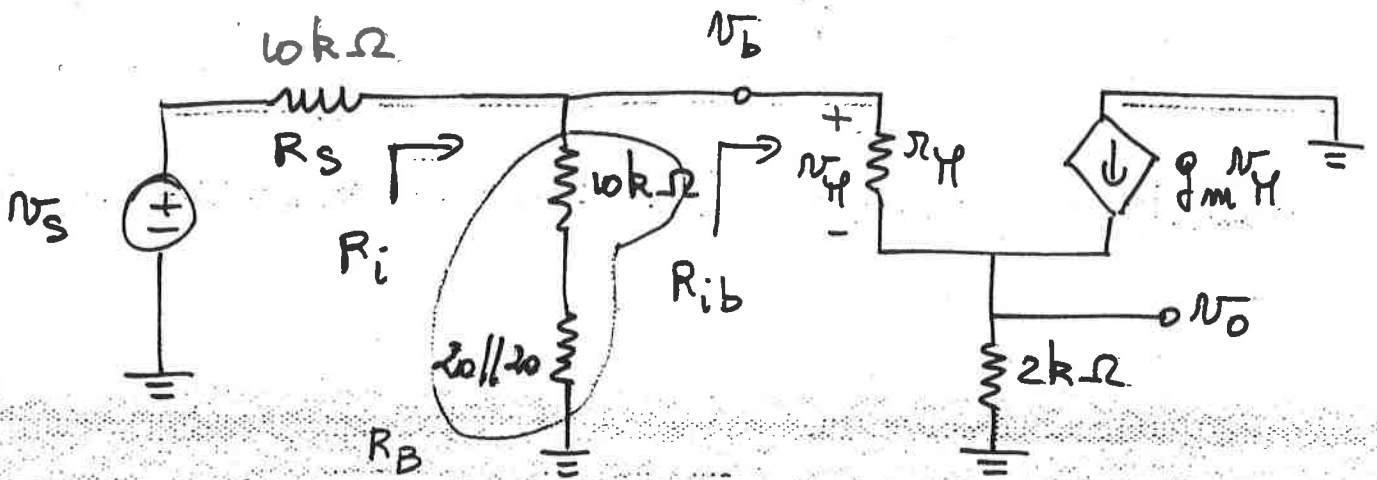
$$v_b = v_{\pi} + v_o = 116.7 v_{\pi}$$

$$R_i = \frac{v_b}{i_i} = \frac{116.7 v_{\pi}}{v_{\pi} / 1.27} = 148.2 \text{ k}\Omega$$

$$\frac{v_o}{v_s} = \frac{v_b}{v_s} \cdot \frac{v_o}{v_b} = \frac{R_i}{R_i + R_s} \cdot \frac{115.7 v_{\pi}}{116.7 v_{\pi}} = 0.93 \text{ V/V}$$

(c)  $C_B$  gen-circuited (no bootstrapping)

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$$R_{iB} = r_{\pi} + (\beta + 1) R_E$$

$$R_{iB} = 203.46 \text{ k}\Omega$$

$$R_i = R_B // 203.46 \text{ k}\Omega = 18.21 \text{ k}\Omega$$

$R_i \ll R_i$  with bootstrapping

$$v_o = \left( g_m v_{\pi} + \frac{v_{\pi}}{r_{\pi}} \right) \times 2 \text{ k}\Omega = 138.4 v_{\pi}$$

$$v_b = v_o + v_{\pi} = 139.4 v_{\pi}$$

$$\frac{v_o}{v_s} = \frac{v_b}{v_s} \cdot \frac{v_o}{v_b} = \frac{R_i}{R_s + R_i} \cdot \frac{v_o}{v_b} = \underline{0.64 \text{ V/V}}$$

→ lower than the value with  
Bootstrapping