



$$R_{in} = \frac{V_x}{I_x}$$

$$V_x = I_x (R_{11} \parallel R_{21} \parallel r_{\pi 1}) \quad \text{--- (1)}$$

$$I_x = I_x \quad \text{--- (2)}$$

$$R_{in} = \frac{I_x (R_{11} \parallel R_{21} \parallel r_{\pi 1})}{I_x}$$

$$= R_{11} \parallel R_{21} \parallel r_{\pi 1}$$

$$= 1k \parallel 50k \parallel 457.465$$

$$= 192.977 \Omega$$