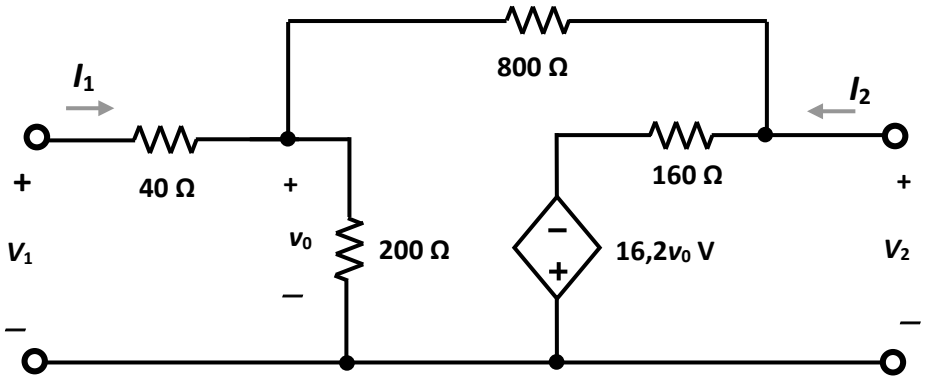
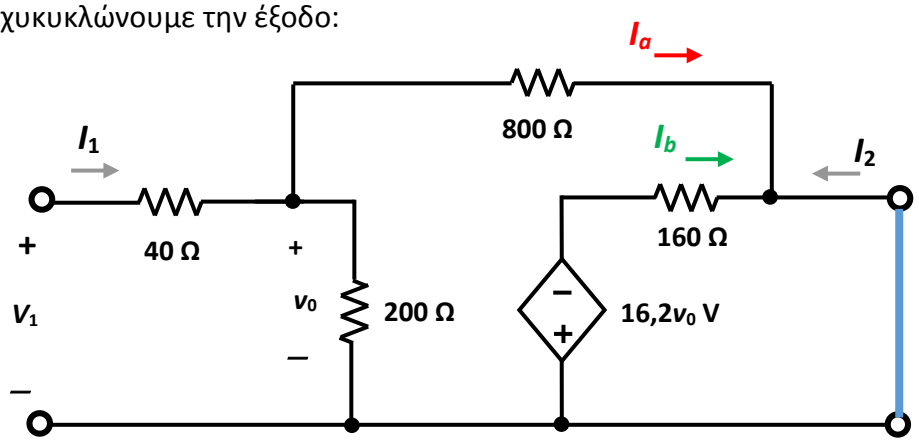
Υπολογίστε τις υβριδικές παραμέτρους για το πιο κάτω κύκλωμα.



$$\begin{pmatrix} V_1 \\ I_2 \end{pmatrix} = \begin{pmatrix} h_{11} & h_{12} \\ h_{21} & h_{22} \end{pmatrix} \begin{pmatrix} I_1 \\ V_2 \end{pmatrix} \Rightarrow \quad h_{11} = \left.\frac{V_1}{I_1}\right|_{V_2=0} \qquad h_{12} = \left.\frac{V_1}{V_2}\right|_{I_1=0}$$

$$h_{21} = \left.\frac{I_2}{I_1}\right|_{V_2=0} \qquad h_{22} = \left.\frac{I_2}{V_2}\right|_{I_1=0}$$

Α. Βραχυκυκλώνουμε την έξοδο:



$$V_1 = I_1\left(40 + \frac{800\times 200}{800+200}\right) = I_1 \times 200 \Rightarrow h_{11} = 200\,\Omega$$

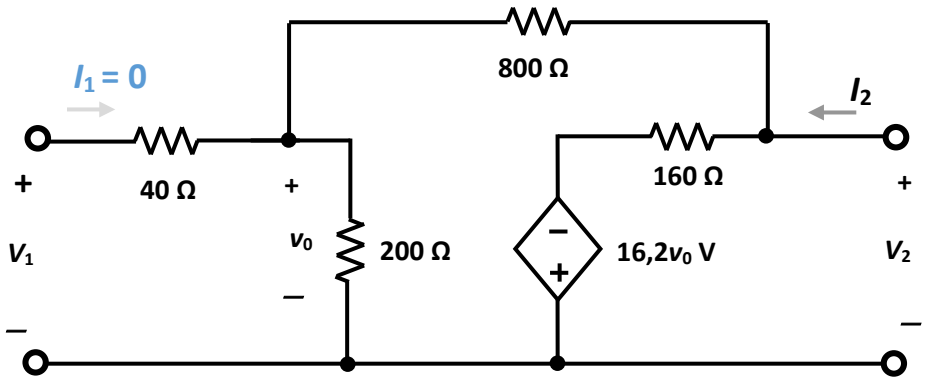
$$I_2 + I_a + I_b = 0$$

- $I_a = I_1 \dfrac{200}{200+800} \Rightarrow I_a = 0,2\ I_1$ (Διαιρέτης ρεύματος)
- $16,2v_0 + 160\ I_b = 0 \Rightarrow 16,2\left(200 \times \dfrac{800}{200+800} I_1\right) + 160\ I_b = 0$ (ΝΤΚ)

  $\Rightarrow 2592\ I_1 + 160\ I_b = 0 \Rightarrow I_b = -16,2\ I_1$

Άρα: $I_2 + I_a + I_b = I_2 + 0,2I_1 - 16,2I_1 \Rightarrow I_2 = 16I_1 \Rightarrow h_{21} = 16$

B. Ανοιχτοκυκλώνουμε την είσοδο



$$I_1 = 0 \Rightarrow v_0 = V_1$$

$$\frac{V_1}{200} + \frac{V_1 - V_2}{800} = 0 \Rightarrow 5V_1 = V_2 \Rightarrow h_{12} = \frac{1}{5}$$ (Κομβικές τάσεις)

Και επίσης με κομβικές τάσεις

$$\frac{V_2 + 16,2\,V_1}{160} + \frac{V_2 - V_1}{800} - I_2 = 0 \Rightarrow 800 I_2 = 5\,V_2 + 81 V_1 + V_2 - V_1$$

$$800 I_2 = 6\,V_2 + 80\,V_1 = 6\,V_2 + 80\,\frac{V_2}{5} = 22\,V_2 \Rightarrow h_{22} = \frac{22}{800} = 27,5\ \text{mS}$$

Οπότε $$\begin{pmatrix} V_1 \\ I_2 \end{pmatrix} = \begin{pmatrix} 200 & 0,2 \\ 16 & 0,0275 \end{pmatrix} \begin{pmatrix} I_1 \\ V_2 \end{pmatrix}$$