$$V_1 = h_{11} I_1 + h_{12} V_2$$
$$I_2 = h_{21} I_1 + h_{22} V_2 .$$

① In class, we derived the desired characteristics of an amplifier using the Y-parameter 2-port network.

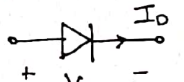
$$I_1 = Y_{11} V_1 + Y_{12} V_2$$
$$I_2 = Y_{21} V_1 + Y_{22} V_2$$

where $Y = \begin{bmatrix} Y_{11} & Y_{12} \\ Y_{21} & Y_{22} \end{bmatrix}$

We saw that $\begin{bmatrix} 0 & 0 \\ Y_{21} & 0 \end{bmatrix}$ gives the best amplifier performance

Please repeat the same with H-parameters.

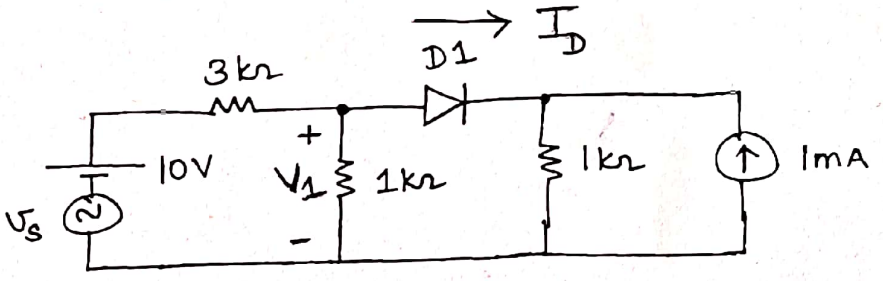
② The I-V characteristics of the diode is given by the equation:-



$I_D = I_S \exp\left(\frac{V_{BE}}{V_T}\right)$. Derive its small signal equivalent.

V_T is the thermal voltage (kT/q) and is 25mV at room temperature.

②



The diode D_1 has a forward voltage drop (built-in voltage) of 0.7V.

(a) Assume $V_S = 0$. Calculate the current through the diode I_D.

(b) Let V_S be a "small" input signal. Calculate the total voltage (dc + small signal) V_1, when $V_S = 10\,mV$.