

1. [60 points] [transfer functions of a source follower]

This is a modification of the first problem in Homework 5.

For the source follower of the small signal equivalent circuit of Figure 6.51 (a), p. 638 of Sedra/Smith, [with symbolic but real parameters]

- a) Using node equations find the 2×1 transfer function matrix, $T(s)$, for the given equivalent circuit of the above mentioned figure where here V_{bs} is a response. I_{in} is the current out of V_{sig} (into the circuit) to give the input admittance.

$$\begin{bmatrix} V_{bs} \\ I_{in} \end{bmatrix} = T(s)[V_{sig}]$$

- b) The numerators and denominators can be factored exactly. Give the zeros and poles and indicate their relative positions in the complex s -plane.
- c) Sketch the {magnitude of the} frequency response of $V_{bs}/V_{sig}(j\omega)$.
2. [40 points] [Colpitts oscillator]
Using a 2N3904 design a Colpitts oscillator to oscillate at 10Mhz. Include biasing circuitry and run a Spice transient response. Compare the calculated oscillation frequency with that found from the Spice run.