Assignment 5
Time-Domain Simulations

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Topics in Electronics I

Simulation of Radio Frequency Circuits

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The objective of this assignment is to help the students grasp the basic notion of the Shooting Method. This is done by be tasking the students to implement the Shooting method to simulate the steady-state response of the circuit and compare it with the stead state response obtained from the Harmonic Balance. The circuit schematic for this purpose is the one shown in Figure 1.

The input to this circuit is a sinusoidal signal having 100mv amplitude at the input voltage, v_{in}, and a frequency of 255MHz, i.e.,

$$v_{\text{in}}(t) = 100 \times 10^{-3} \cos(2 \times \pi \times 255 \times 10^6 \times t) \tag{1}$$

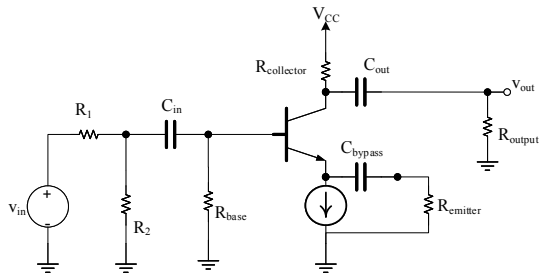

Figure 1: A circuit schematic for a common-emitter.

Here are few tips to help you in developing the program to implement the shooting method.

- The method to be used for the transient simulations is the TR method.
- The step size that you should use is $0.05T$, where $T = 1/5e6$
- The initial guess for the initial condition, i.e. $x_0^{(0)}$ should be the `Xic` returned by the HiSPICE interface.
- the convergence tolerance should be set to $1e - 12$.

Files to Submit

(a) One file named `compute_sm_steady_state.m`. The interface to this file is should be as follows
`[node_voltage] = compute_sm_steady_state(node_name)` Here

- `node_name` is a string that describes the name of the node whose voltage is to be computed in the steady-state.

- `node_voltage` is the values of the voltage of the node whose name is given by `node_name`, returned as a vector of voltages values at the time instants generated during the TR.

(b) A PDF file with one graph showing a comparison between the waveforms computed from the Harmonic Balance and Shooting Method.