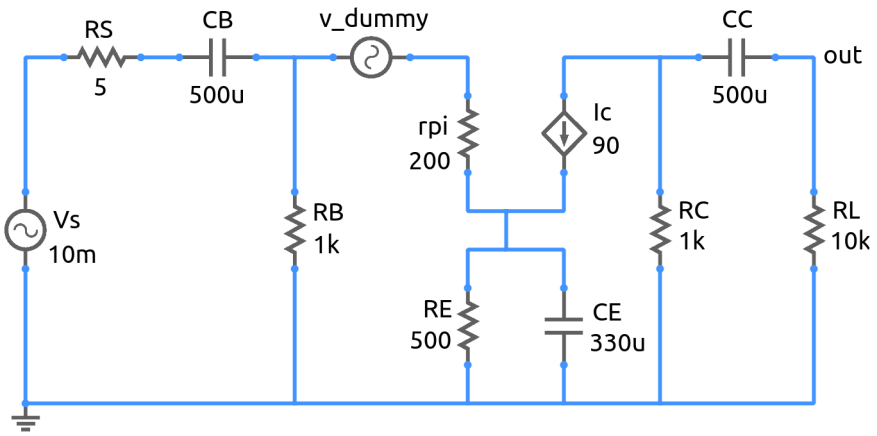
ce_amp_1.sqproj



Small-signal equivalent circuit of
common-emitter amplifier

(low frequencies)

A representative small-signal equivalent circuit of a common-emitter amplifier at low frequencies is shown in the figure. Device capacitances (C_π and C_μ) are not included since they present a high impedance at low frequencies and can therefore be treated as open circuits.

Exercise Set

1. For the component values given in the figure, calculate the mid-band gain A_V $(= v_o/v_s)$. Verify with simulation.

2. How will A_V change if (a) r_π is doubled? (b) R_E is doubled? (c) R_C is doubled?

   (We should keep in mind that, in practice, the above values cannot be changed at will because of their effect on the bias conditions of the transistor.)

3. Plot the frequency response (i.e., gain versus frequency on log-log scale). By changing the capacitance values C_B, C_C, C_E one at a time, find out which capacitance is playing a dominant role in determining the frequency response of the amplifier. Explain your observations.

References

1. A. S. Sedra, K. C. Smith, and A. N. Chandorkar, *Microelectronic Circuits: Theory and Applications*, Fifth edition, Oxford University Press, 2009.

2. P. R. Grey and R. G. Meyer, *Analysis and Design of Analog Integrated Circuits,* John Wiley and Sons, 1995.