

1. Assume the op amps in Fig. 1 are ideal.

(a) Derive the transfer function of the circuit in Fig. 1-1. Find the voltage gain at DC and at very high frequencies. [15%]

(b) Derive the transfer function of the circuit in Fig. 1-2. Find the voltage gain at DC and at very high frequencies. [15%]

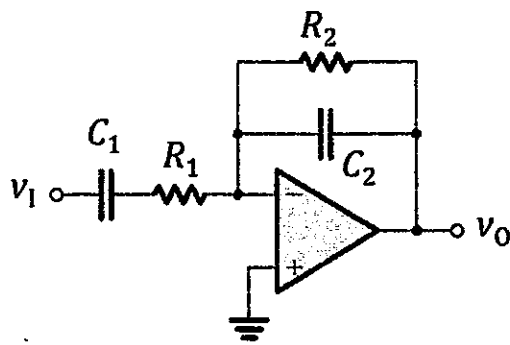


Fig. 1-1

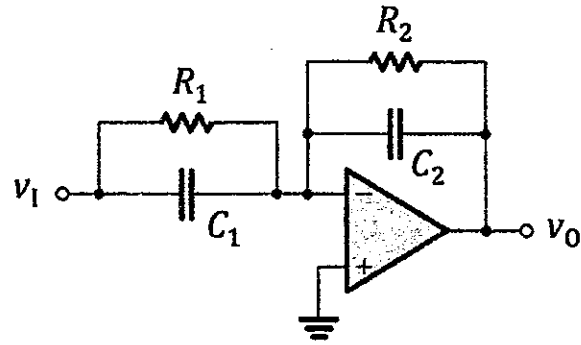


Fig. 1-2

2. For the circuit in Fig. 2, C_{C1} , C_{C2} , and C_E are considered very large capacitors. The parameters are given as $V_{CC} = 10\text{ V}$, $R_B = 600\text{ k}\Omega$, $R_C = 4\text{ k}\Omega$, $R_e = 0.1\text{ k}\Omega$, $R_E = 3.3\text{ k}\Omega$, $R_{sig} = 10\text{ k}\Omega$, and $R_L = 20\text{ k}\Omega$. The current gain β of the BJT is 100.

(a) Perform DC analysis and find the DC voltage at the collector of the BJT. [10%]

(b) Find R_{in} and R_{out} of the amplifier by neglecting r_o . [10%]

(c) Find the voltage gain (v_o/v_{sig}) of the amplifier. [10%]

(d) What is the voltage gain (v_o/v_{sig}) with ideal signal source and load? [10%]

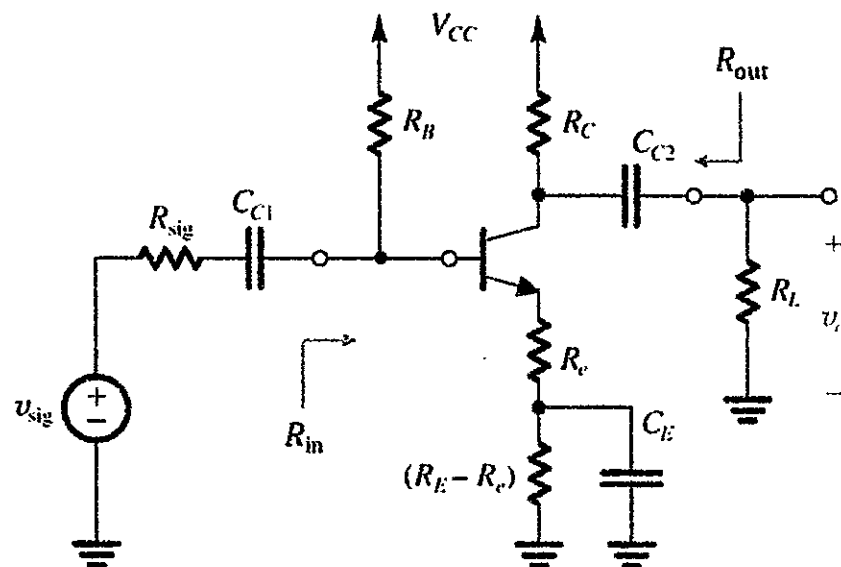


Fig. 2

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3. The ac equivalent circuit of a MOS cascode amplifier is shown in Fig. 3. The small-signal parameters of all MOSFETs are specified as g_m and r_o . For $R_L = g_m(r_o)^2$, answer the following questions with proper approximation.

- (a) Derive the voltage gain v_o/v_i . [10%]
- (b) What is the voltage gain v_{o1}/v_i ? [10%]
- (c) What is the voltage gain v_o/v_{o1} ? [10%]

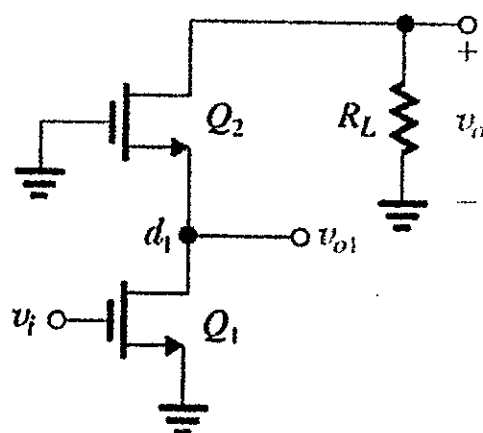


Fig. 3

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