and one negative) instead of one. The DC bias circuit connected to the base consists of a single resistor. Determine V_{CEQ} and the region of operation.

$V_{CC} = 12$ V $\quad V_{EE} = 4$ V
$\beta = 100$ $\quad R_B = 100$ kΩ
$R_C = 3$ kΩ $\quad R_E = 3$ kΩ
$R_L = 6$ kΩ $\quad R_S = 0.6$ kΩ
$v_S = 1\ \cos(6.28 \times 10^3 t)$ mV

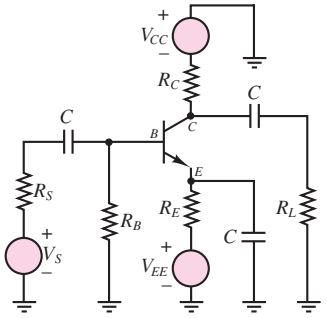


Figure P10.33

10.34 Shown in Figure P10.34 is a common-emitter amplifier stage implemented with an *npn* silicon transistor. The DC bias circuit connected to the base consists of a single resistor; however, it is connected directly between base and collector. Determine V_{CEQ} and the region of operation.

$V_{CC} = 12$ V
$\beta = 130$ $\quad R_B = 325$ kΩ
$R_C = 1.9$ kΩ $\quad R_E = 2.3$ kΩ
$R_L = 10$ kΩ $\quad R_S = 0.5$ kΩ
$v_S = 1\ \cos(6.28 \times 10^3 t)$ mV

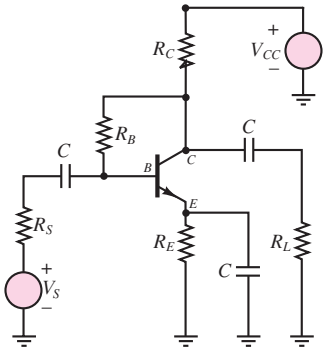


Figure P10.34

10.35 For the circuit shown in Figure P10.35 v_S is a small sine wave signal with average value of 3 V. If $\beta = 100$ and $R_B = 60$ kΩ.

a. Find the value of R_E so that I_E is 1 mA.
b. Find R_C so that V_C is 5 V.
c. For $R_L = 5$ kΩ, find the small-signal equivalent circuit of the amplifier.
d. Find the voltage gain.

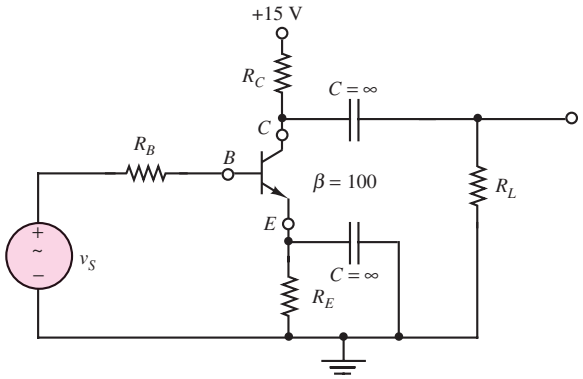
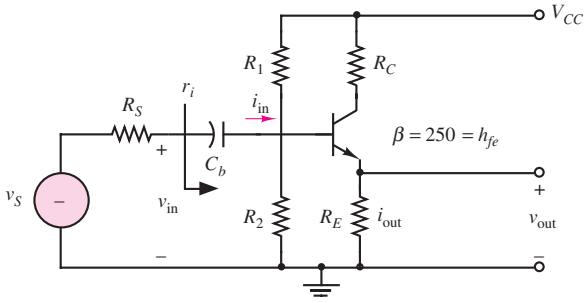


Figure P10.35

10.36 The circuit in Figure P10.36 is in the common-collector configuration. Assuming $R_C = 200$ Ω:

a. Find the operating point of the transistor.
b. If the voltage gain is defined as v_{out}/v_{in}, find the voltage gain. If the current gain is defined as i_{out}/i_{in}, find the current gain.
c. Find the input resistance, r_i.
d. Find the output resistance, r_o.



$R_E = 250$ Ω $\quad R_1 = 9{,}221$ Ω
$V_{CC} = 15$ V $\quad C_B = \infty$
$R_2 = 6{,}320$ Ω

Figure P10.36

10.37 The circuit that supplies energy to an automobile's fuel injector is shown in Figure P10.37(a). The internal circuitry of the injector can be