

1. For the amplifier circuit in Fig. 1, the parameters are given as:

$V_{CC} = 6\text{ V}$	$R_{B1} = 300\text{ k}\Omega$	$R_{B2} = 300\text{ k}\Omega$	$R_C = 10\text{ k}\Omega$
$R_E = 10\text{ k}\Omega$	$R_e = 250\text{ }\Omega$	$R_{sig} = 10\text{ k}\Omega$	$R_L = 10\text{ k}\Omega$
$C_{C1}, C_{C2}, C_E = \infty$	$\beta\text{ of BJT} = 100$		

- (a) Perform DC analysis and find the collector current (I_C) and collector voltage (V_C). [10%]
 (b) Find R_{in} and R_{out} of the amplifier. [20%]
 (c) What is the voltage gain (v_o/v_{sig}) of the amplifier? [10%]
 (d) Define the output voltage swing range of the amplifier. [10%]

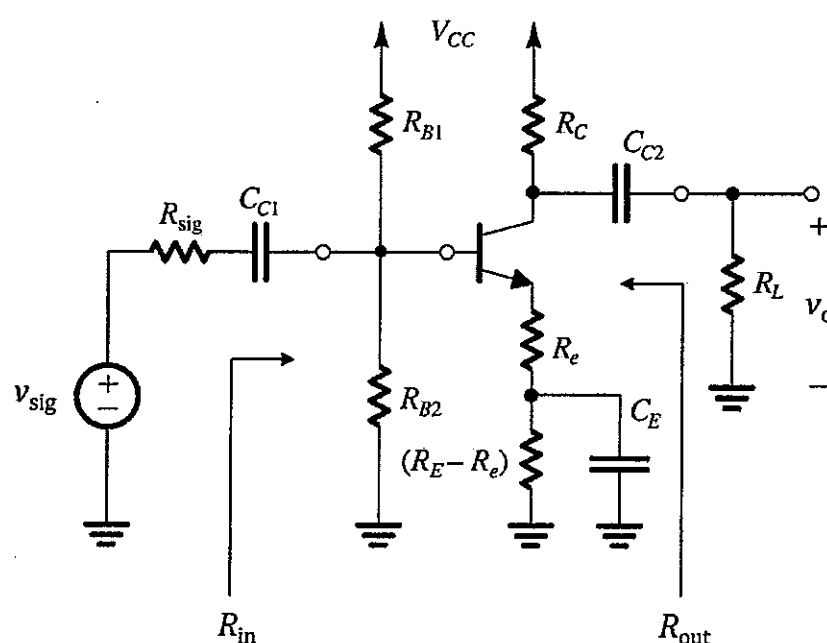


Fig. 1

2. For a two-stage op amp, the transfer function can be expressed as $\frac{A_0(1-s/\omega_z)}{(1+s/\omega_{P1})(1+s/\omega_{P2})}$, where $A_0 = 10^5$, $\omega_{P1} = 10^2\text{ rad/s}$, $\omega_{P2} = 10^8\text{ rad/s}$, and $\omega_z = 10^7\text{ rad/s}$.

- (a) If the op amp is used in a feedback system with a feedback factor $\beta = 0.1$, find the phase margin. [10%]
 (b) If the op amp is used as a unity gain buffer, find the DC gain and the phase margin. [20%]
 (c) If ω_z can be modified without changing the other parameters of the op amp, how do you choose the value of ω_z to achieve a phase margin of 60° for the unity-gain buffer? [20%]