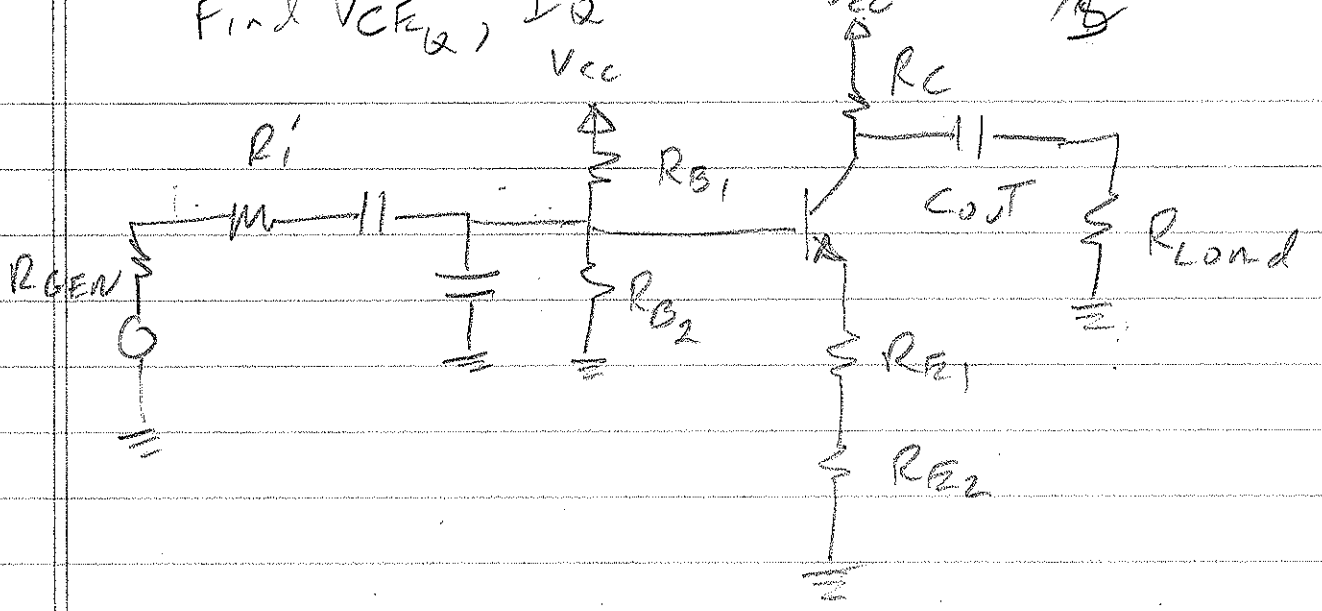
CE AMP

Find V_{CE_Q}, I_Q



FOR BIAS $R_E = R_{E_1} + R_{E_2}$

Given

$V_{OUT_{PEAK}}$ R_{Load}, V_{CC} R_{GEN}, R_i'

Select V_{E_Q} ABOUT 2 V_{DC} TO 3 V_{DC}

CASE 1; $R_{E_1} + R_{E_2}$ BOTH BYPASSED

CASE 2; $R_{E_1} = R_{EF}$ NOT BYPASSED

$R_{E_2} = R_{EB}$ BYPASSED

Find I_{Load}

$I_{L_{PEAK}} = V_{OUT_{PEAK}} / R_{Load}$

$R_S' = R_{GEN} + R_i'$

$r_\pi = \dfrac{\beta v_t}{I_{C_Q}}$

CE AMP

Find I_{CQ} V_{CQ} R_C

Find V_{CQ}

20% V_{out} Do not Design For an edge

$$V_{C_{max}} = V_{CC} - V_{out} - 0.2V_{out}$$

$$V_{C_{min}} = V_E + V_{CE_{SAT}} + V_{out} + 0.2V_{out}$$

$$V_{CE_{SAT}} \cong 0.2V$$

$$V_{CQ} = \frac{V_{C_{max}} - V_{C_{min}}}{2} + V_{C_{min}}$$

$$V_{CE_Q} = V_{CQ} - V_{EQ}$$

Find I_{CQ} And R_C

$$V_{RC_Q} = V_{CC} - V_{CQ} \Rightarrow I_{CQ} = V_{RCQ}/R_C = \beta I_B$$

$$V_{out} = i_b \beta (R_C \| r_o \| R_L)$$

$$V_{out} = \frac{i_c R_C (r_o \| R_L)}{R_C + (r_o \| R_L)} = \frac{V_{RC}(r_o \| R_L)}{R_C + (r_o \| R_L)}$$

$$R_C = \frac{V_{RC}}{V_{out} + 0.2V_{out}} (r_o \| R_L) - (r_o \| R_L)$$

CC Amp

3/5

Find V_E, R_E, I_{CQ}

Find V_E:

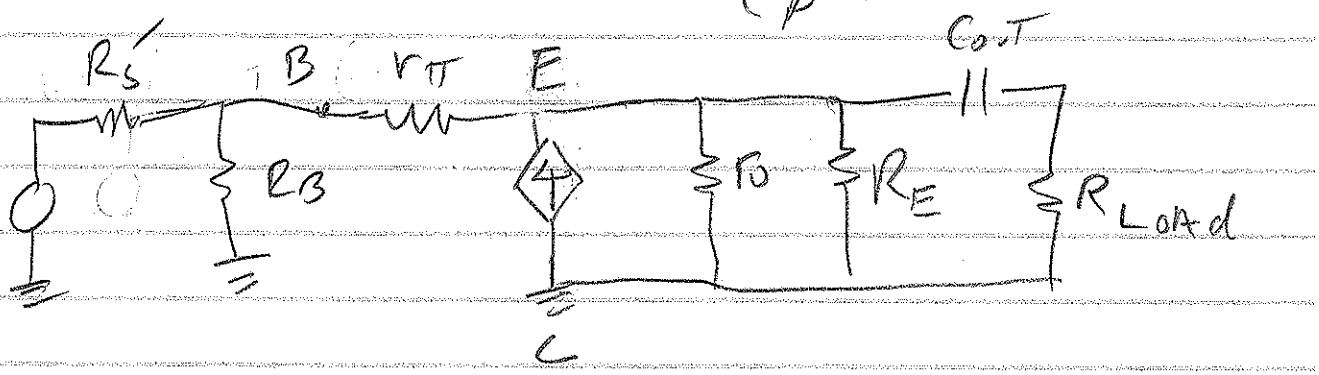
$$V_{E_{min}} = V_{OUT} + 20\% V_{OUT}$$

$$V_{E_{MAX}} = V_{CC} - V_{CE_{SAT}} - V_{OUT} - 20\% V_{OUT}$$

$$V_{E_Q} = \frac{V_{E_{MAX}} - V_{E_{min}}}{2} + V_{E_{min}}$$

Find R_E, I_{CQ}

$$V_E = I_E R_E \qquad I_E = \left(\frac{\beta+1}{\beta}\right) I_C$$



$$V_{OUT} = I_E (R_E \| r_o \| R_L)$$

$$R_E = \frac{V_{R_E}\ (r_o \| R_L)}{V_{OUT} - V_{OUT} + 20\% V_{OUT}\ (r_o \| R_L)}$$

$$I_E = \frac{V_{R_C}}{R_E} \qquad I_C = \frac{\beta}{\beta+1} I_E$$

CC Amp Find r_o, 1 4/5

$$R_E = \frac{I_E R_E (r_o \| R_L)}{V_{OUT} + 20\% V_{OUT}} \quad (r_o \| R_L)$$

($I_E R_E$ = V_E)

$$R_E = \frac{V_E}{V_{OUT} + 0.2 V_{OUT}} (r_o \| R_L) \quad (r_o \| R_L)$$

guess AT r_o

Find r_o

From the CURVES Find r_o, β

FOR CE use $I_C = (2.5) I_L$ TO Find r_o

CC use $I_C = (3.0) I_L$ TO Find r_o

AFTER you Find Q-point → CHECK r_o → how close

$$I_{E_Q} = \frac{V_{E_Q}}{R_E} \qquad I_{C_Q} = I_{E_Q} \frac{\beta}{\beta + 1}$$

CS Amp . CD Amp 5/5

For CS Amp Find R_D the same way you Found R_C FOR CE Amp

And R_S = the same as R_E

For CD Find R_S the same way as you Found R_E for CC Amp