BJT Amplifier Overview (H.9)

20170517

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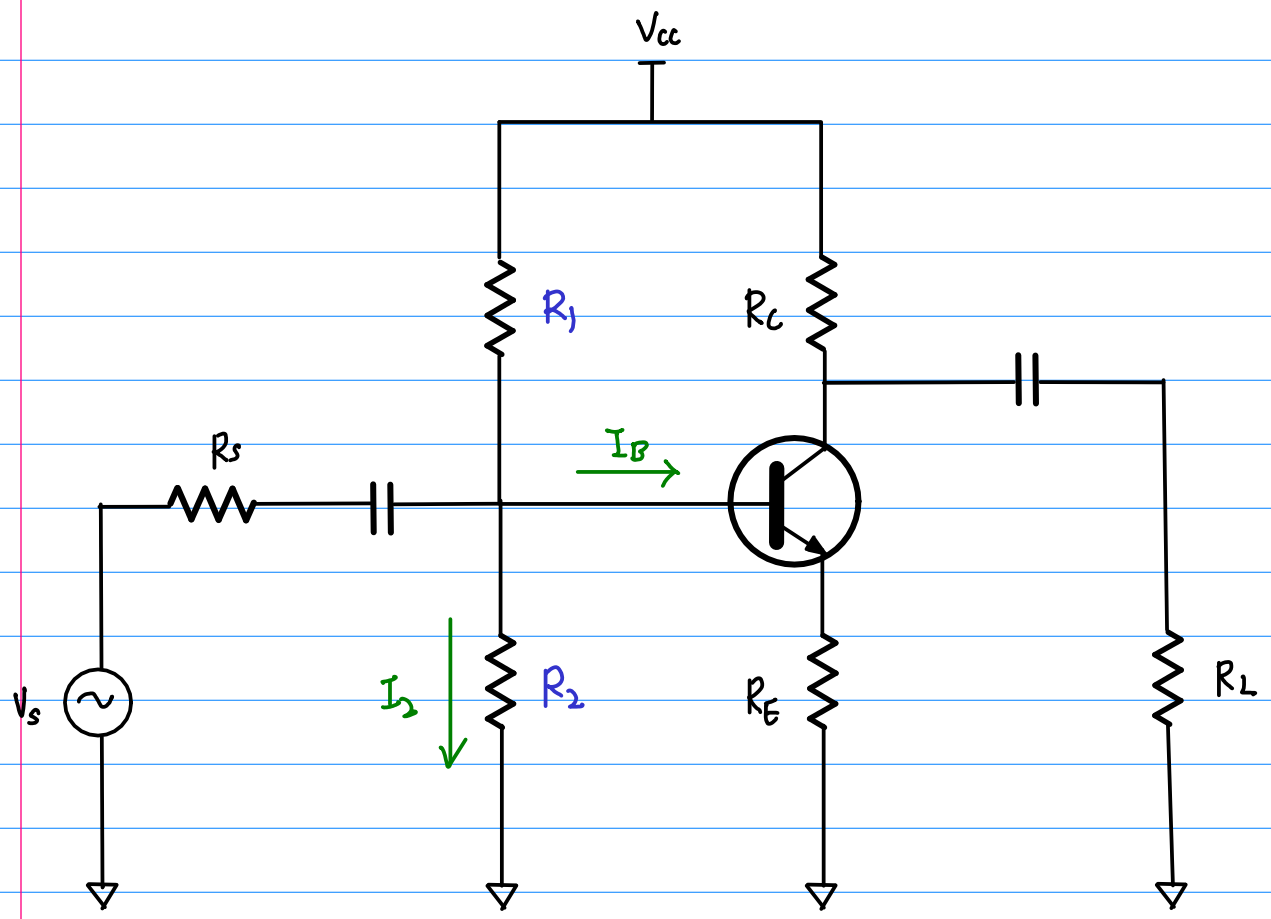
References

Based

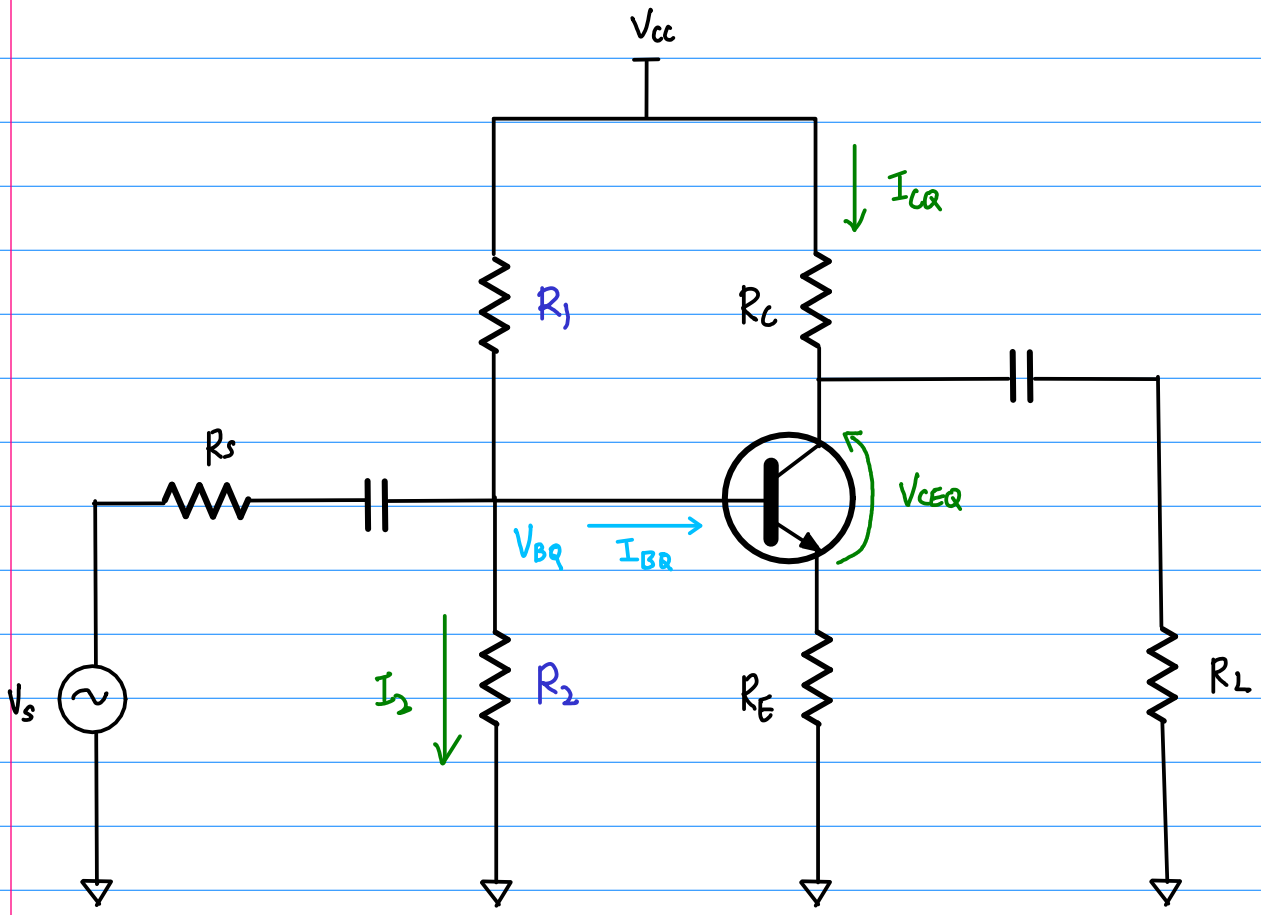
[1] Floyd, Electronic Devices 7th ed
[2] Cook,

[2] en.wikipedia.org


Vcc
R1
RC
Rs
IB
Vs
I2
R2
RE
RL

I_C	I_c
I_E	I_e
I_B	I_b
V_{CE}	V_{ce}

I_C	I_E	I_B	V_{CE}	DC quantities
I_c	I_e	I_b	V_{ce}	ac quantities (rms, peak, peak-to-peak)
i_c	i_e	i_b	v_{ce}	instantaneous quantities

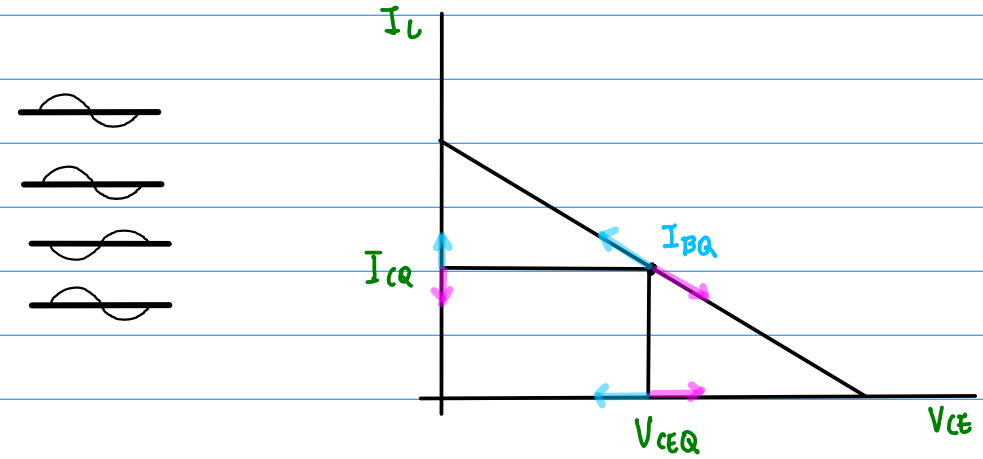


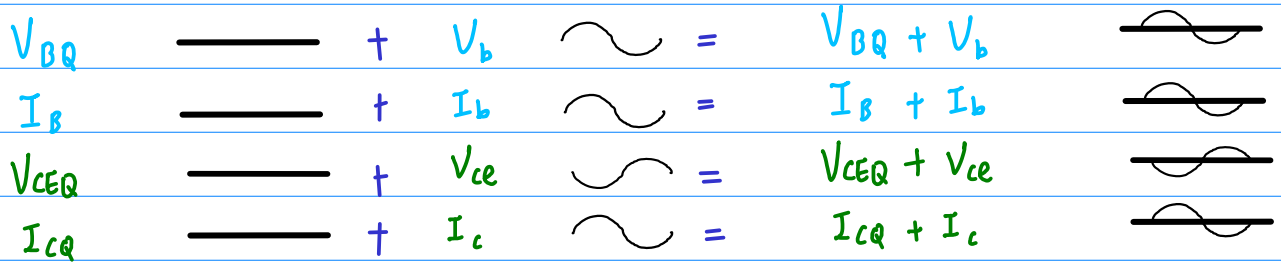
$V_{BQ} + V_b$

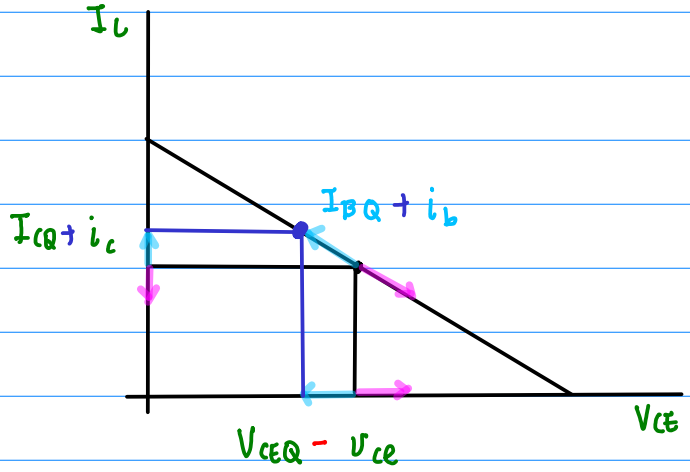
$I_B + I_b$

$V_{CEQ} + V_{ce}$

$I_{CQ} + I_c$




V_{BQ} + v_b = $V_{BQ} + v_b$
I_B + i_b = $I_B + i_b$
V_{CEQ} + v_{ce} = $V_{CEQ} + v_{ce}$
I_{CQ} + i_c = $I_{CQ} + i_c$

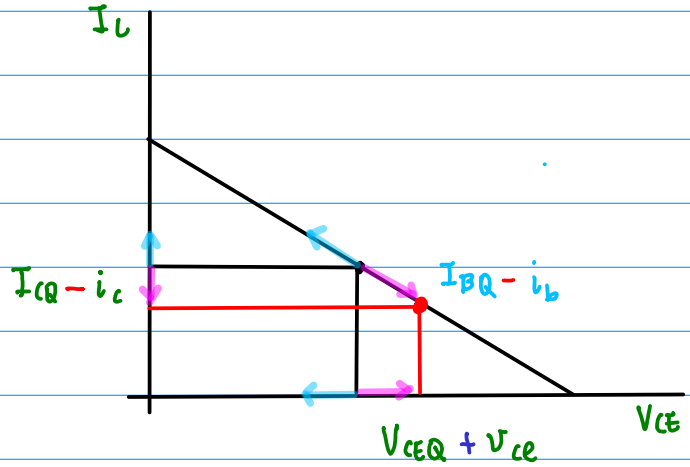


$V_{BQ} + v_b$

$I_B + i_b$

$V_{CEQ} - v_{ce}$

$I_{CQ} + i_c$

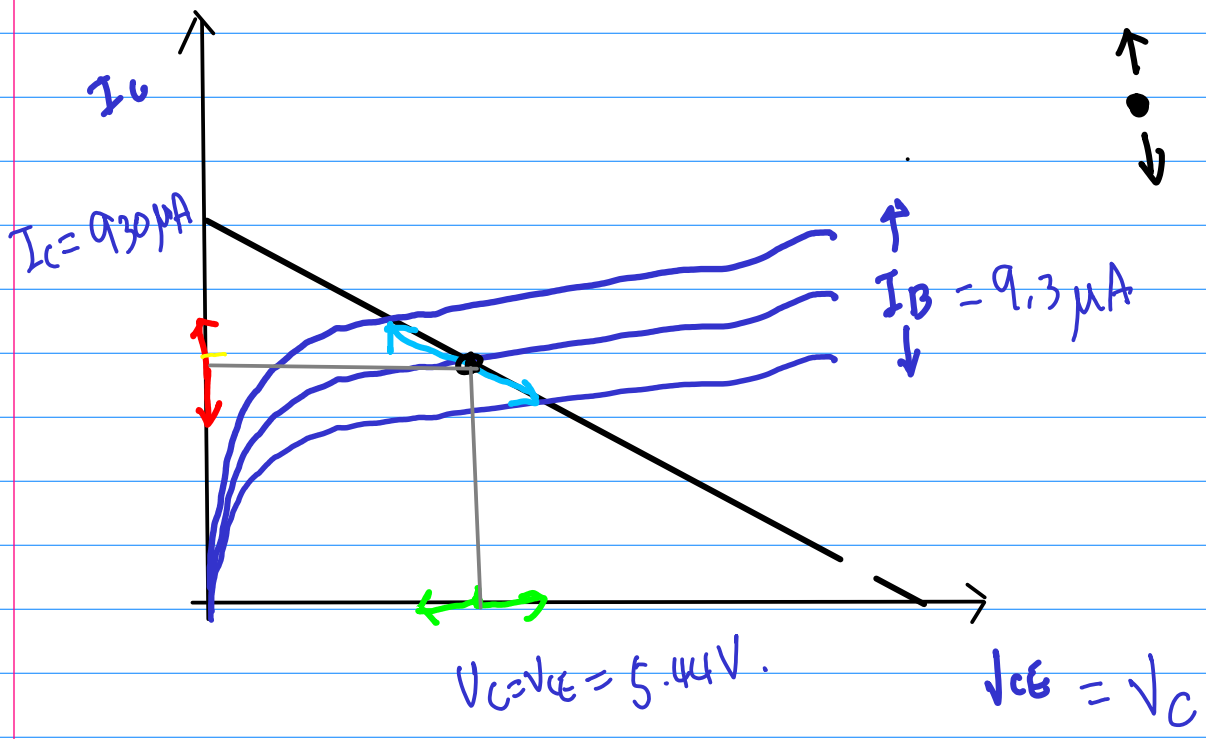


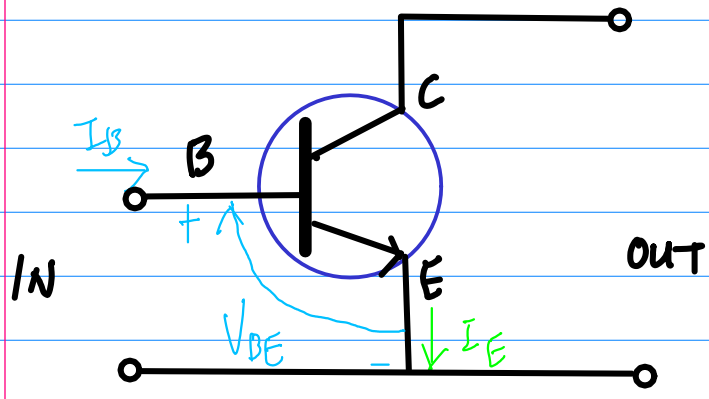
$V_{BQ} - v_b$

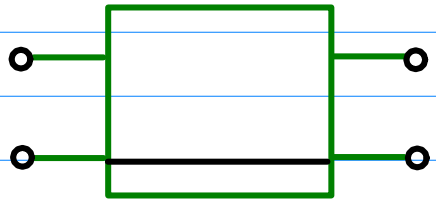
$I_B - i_b$

$V_{CEQ} + v_{ce}$

$I_{CQ} - i_c$

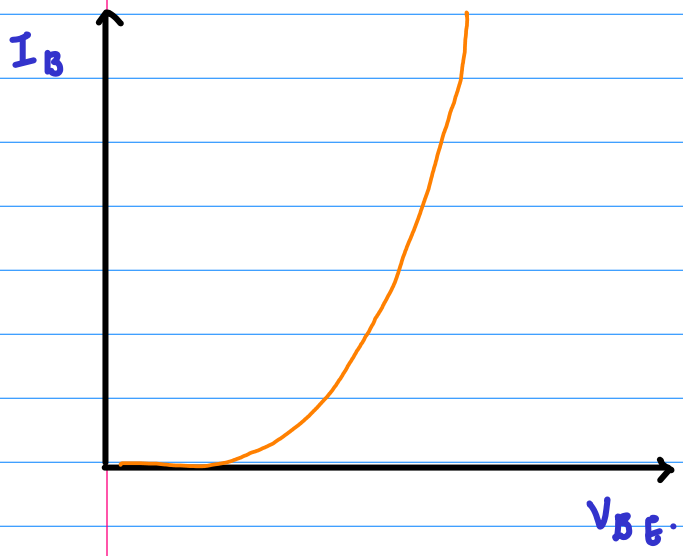

I_C
$I_C = 930\mu A$
$I_B = 9.3\mu A$
$V_C = V_{CE} = 5.44V$.
$V_{CB} = V_C$





common emitter

IN - Characteristic



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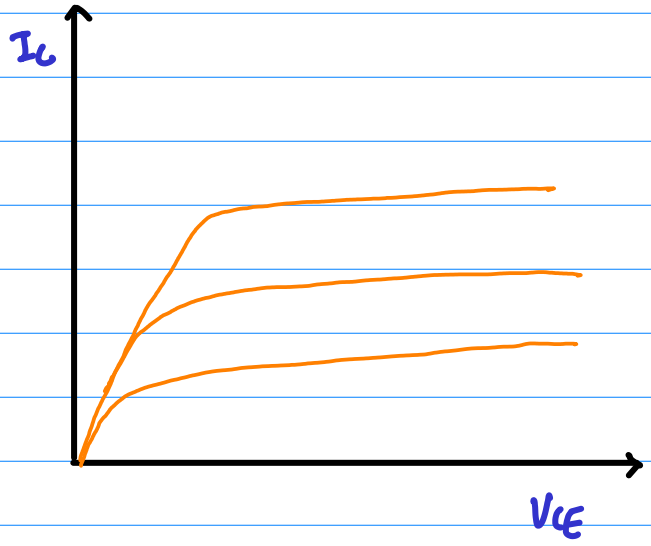
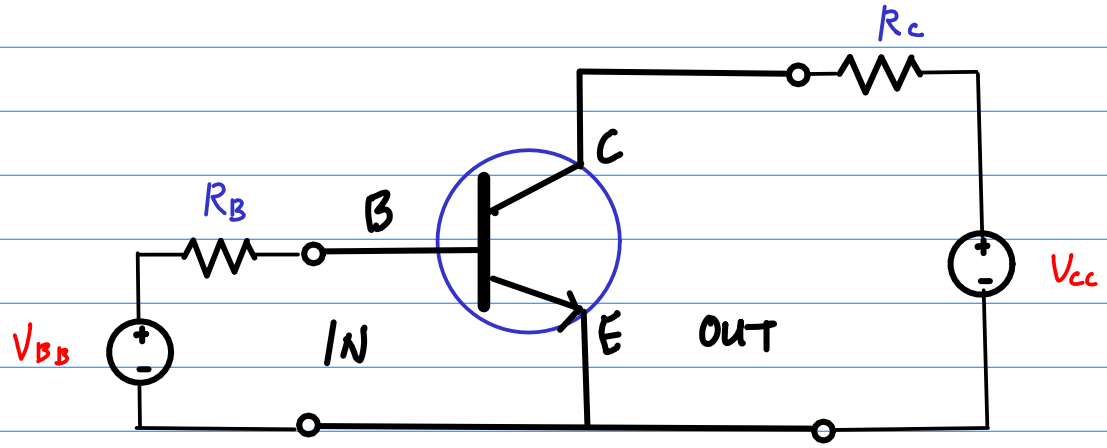
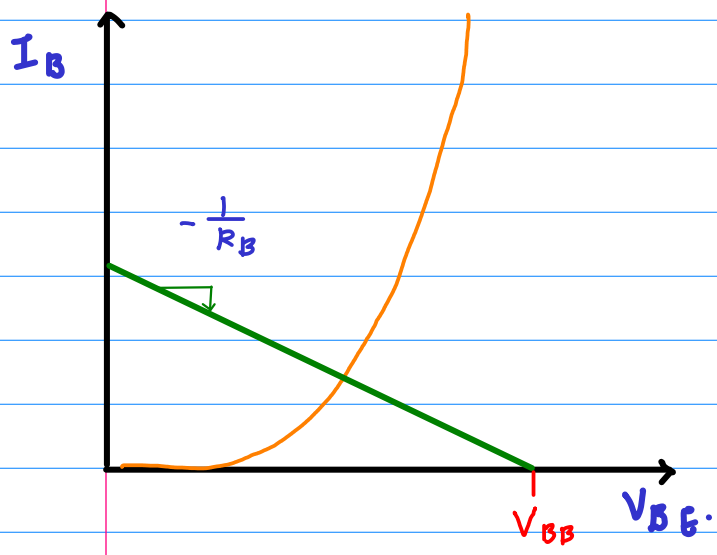


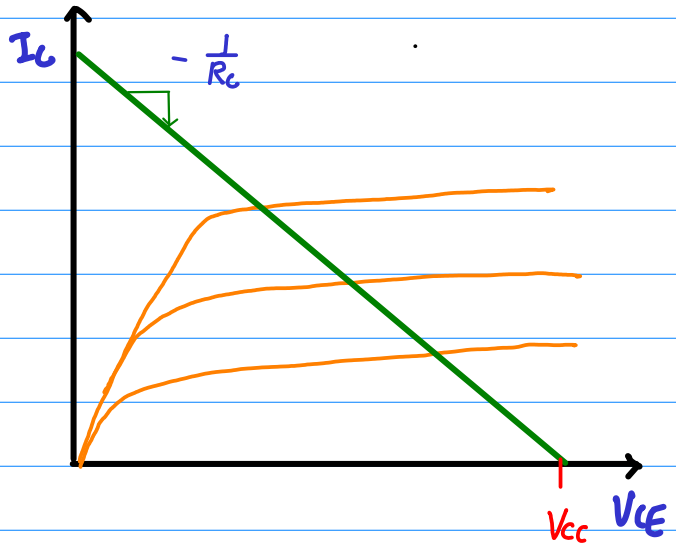


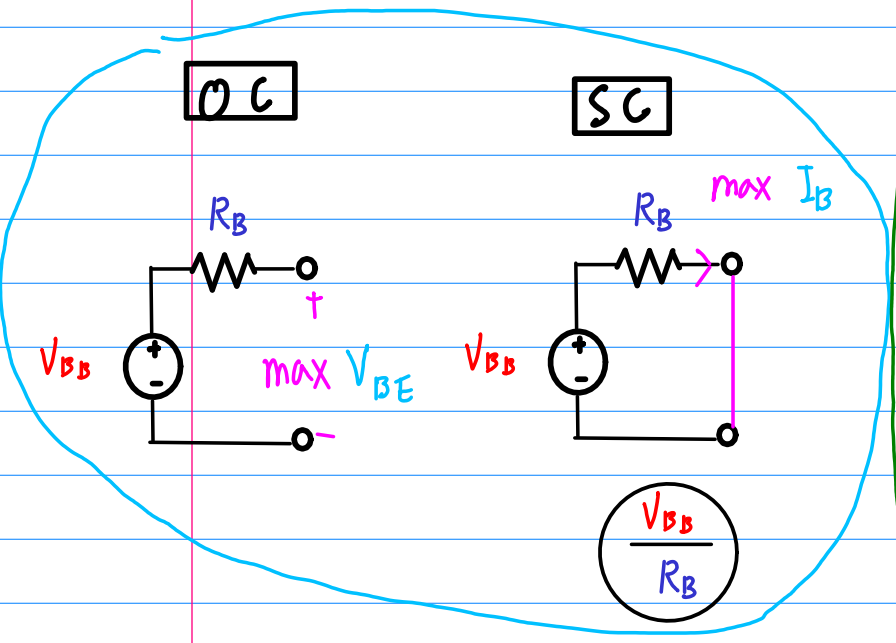
common emitter

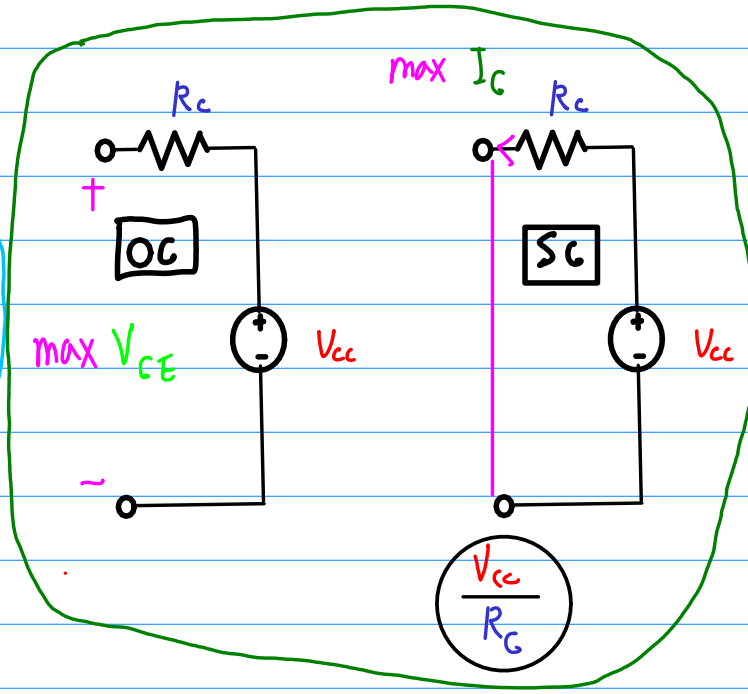
IN - Characteristic



OUT - Characteristic







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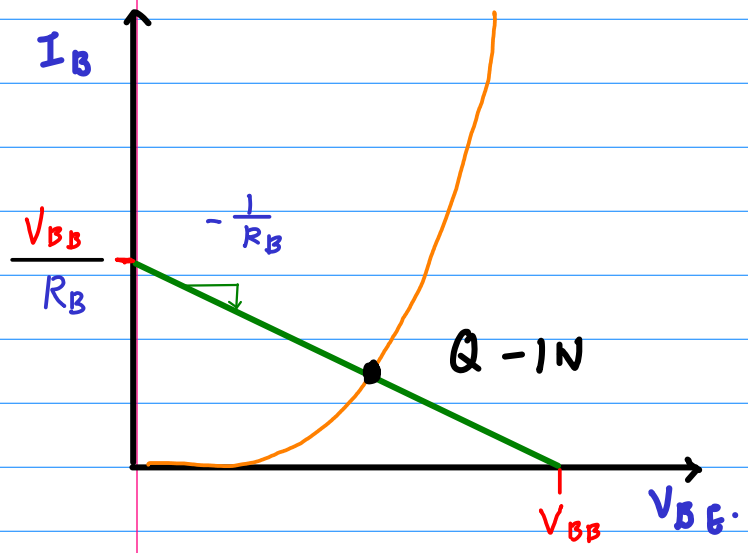
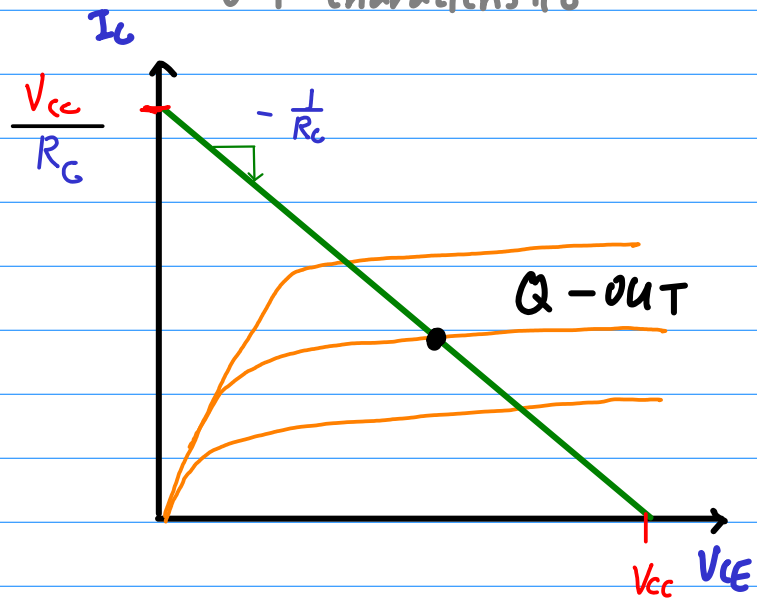
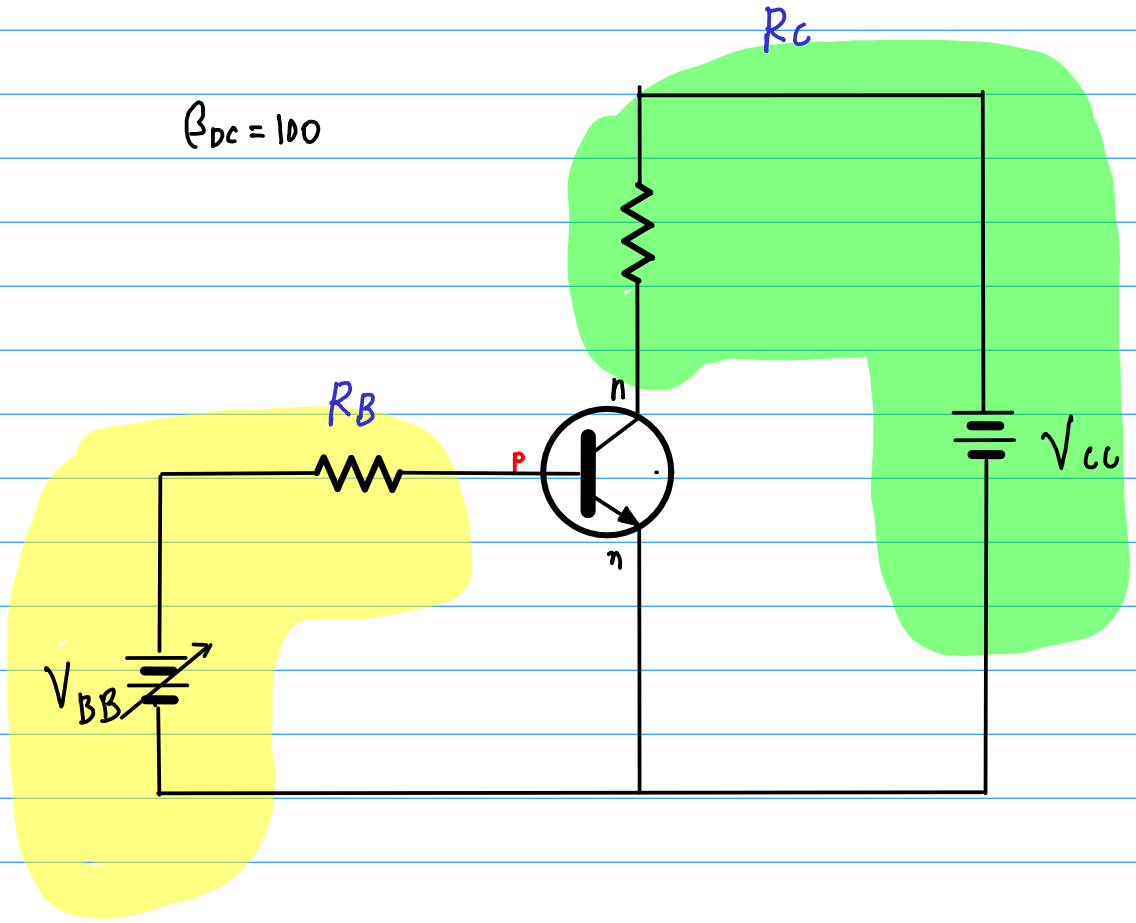
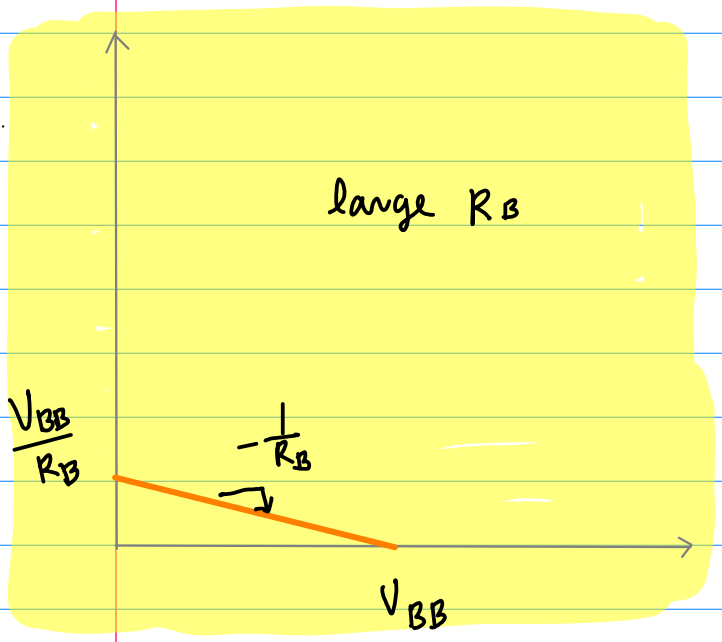


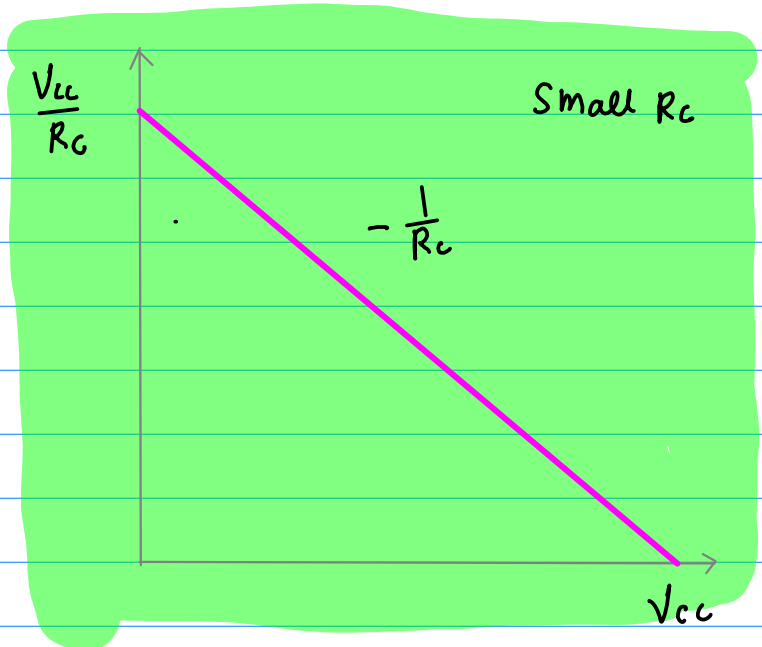
OUT - Characteristic

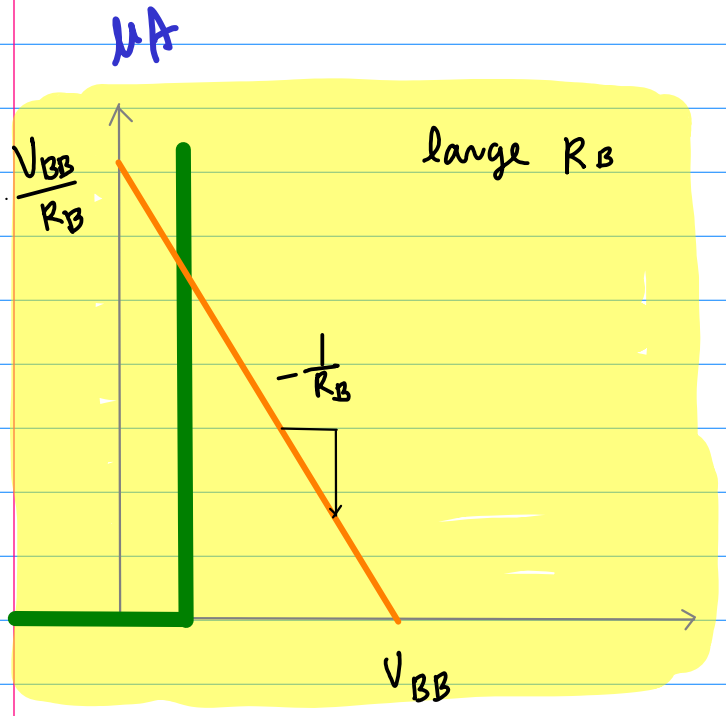


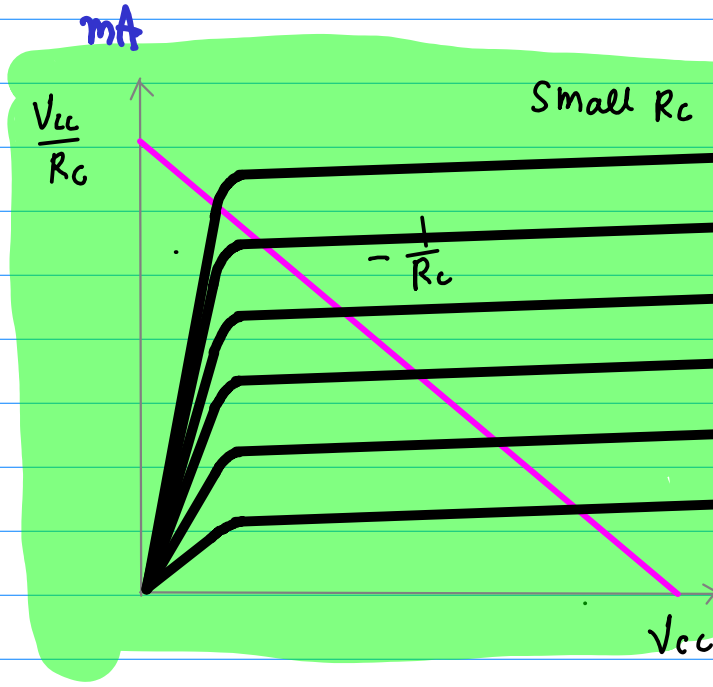
$\beta_{DC} = 100$

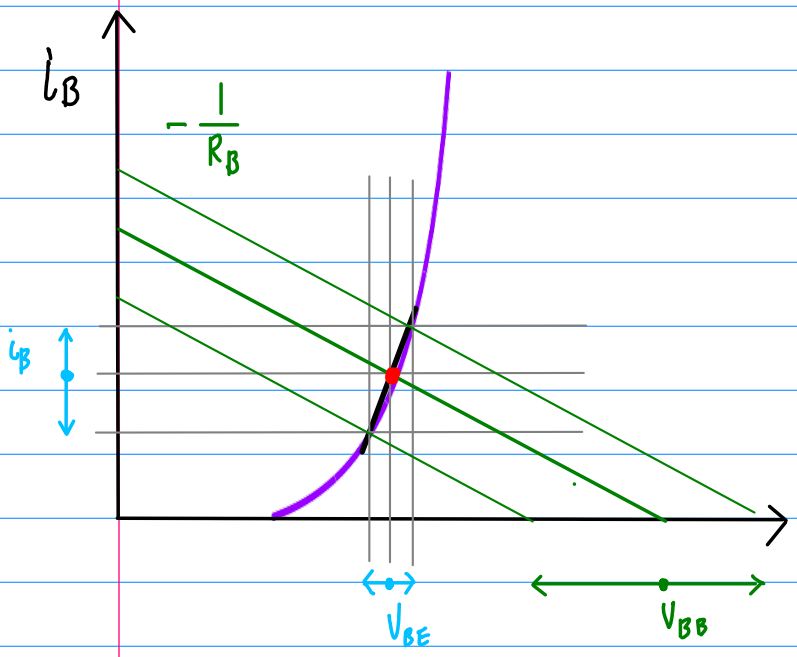

R_C
R_B
n
P
n
V_{CC}
V_{BB}

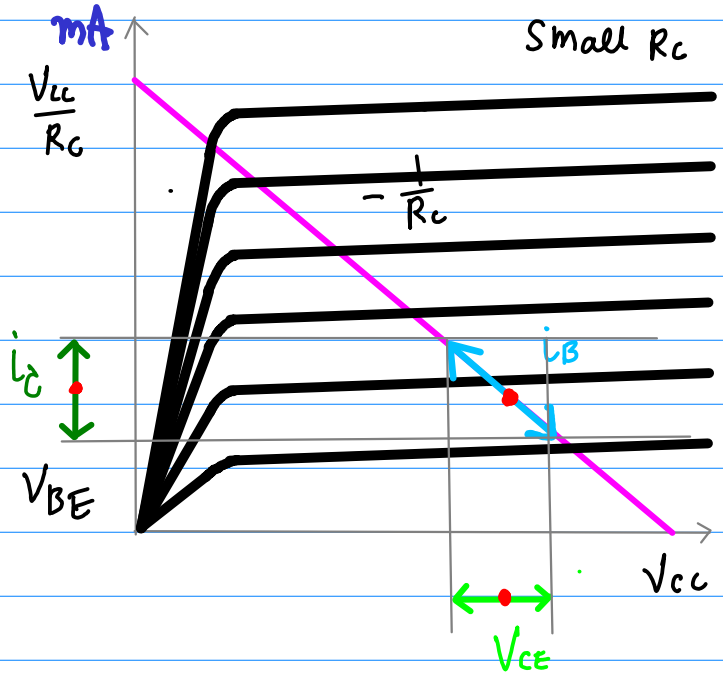

large R_B
$\frac{V_{BB}}{R_B}$
$-\frac{1}{R_B}$
V_{BB}

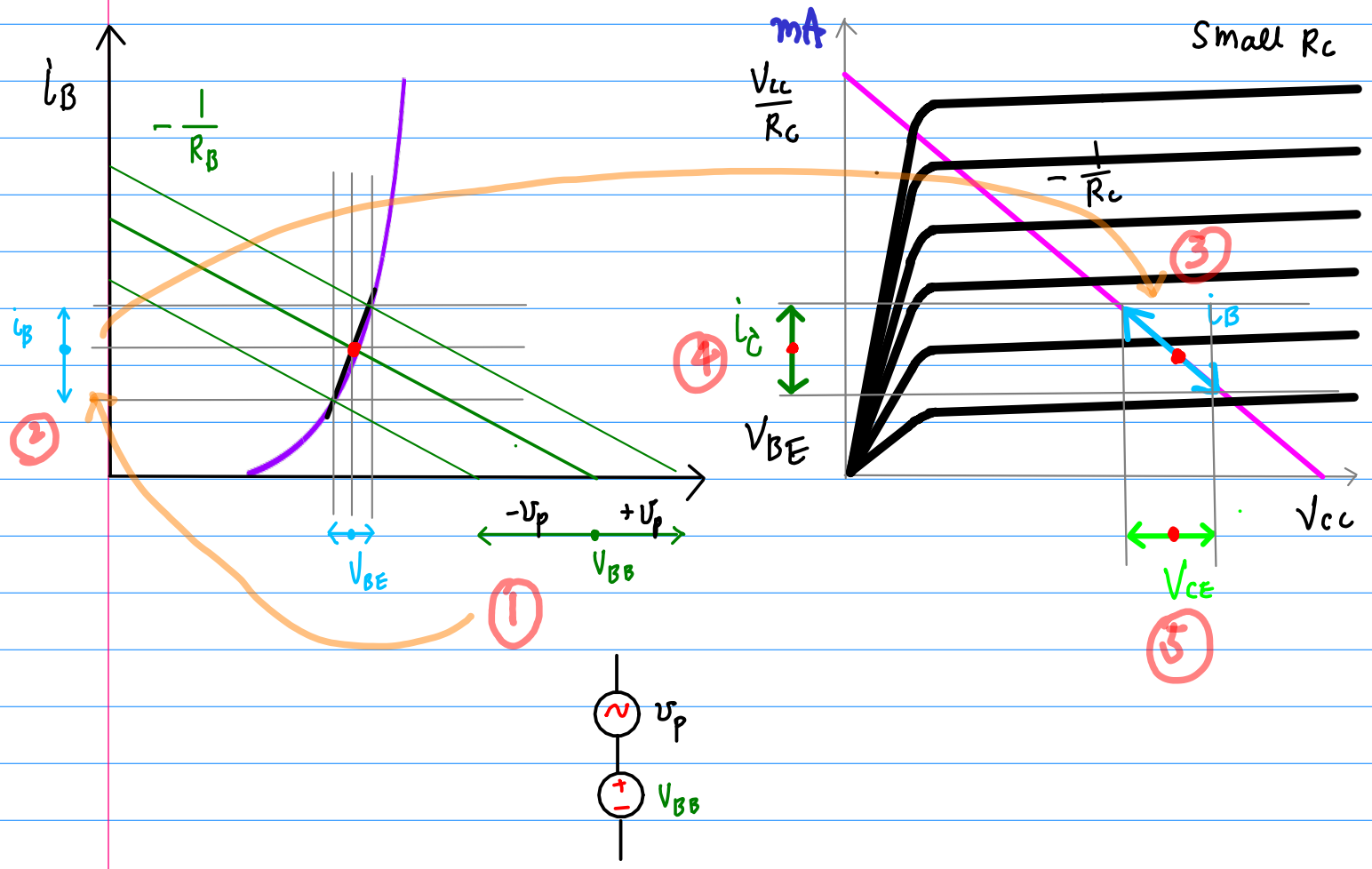

$\frac{V_{CC}}{R_C}$
Small R_C
$-\frac{1}{R_C}$
V_{CC}


μA
large R_B
$\frac{V_{BB}}{R_B}$
$-\frac{1}{R_B}$
V_{BB}


mA
Small R_C
$\frac{V_{CC}}{R_C}$
$-\frac{1}{R_C}$
V_{CC}


I_B
$-\frac{1}{R_B}$
i_B
V_{BE}
V_{BB}

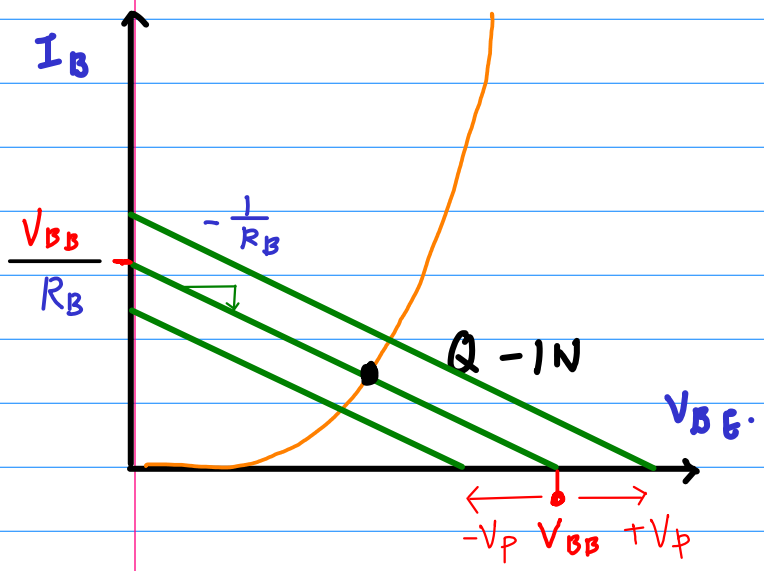

mA
Small R_C
$\frac{V_{CC}}{R_C}$
$-\frac{1}{R_C}$
i_C
i_B
V_{BE}
V_{CC}
V_{CE}


i_B
$-\frac{1}{R_B}$
i_B
$-v_p$
$+v_p$
V_{BE}
V_{BB}
mA
$\frac{V_{cc}}{R_C}$
Small R_C
$-\frac{1}{R_C}$
i_C
V_{BE}
i_B
V_{CE}
V_{cc}
1
2
3
4
5

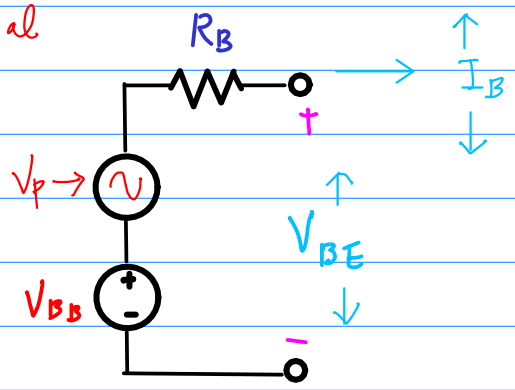
v_p
V_{BB}

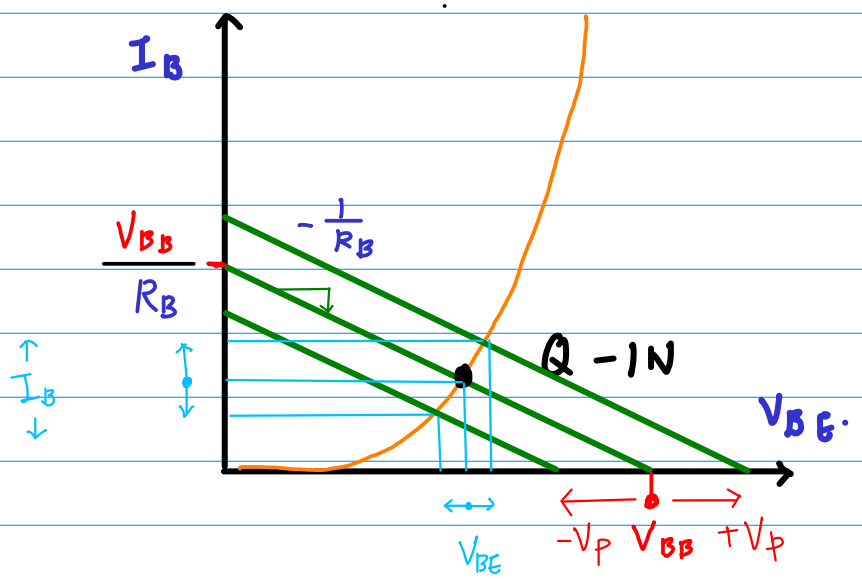
How to change I_B

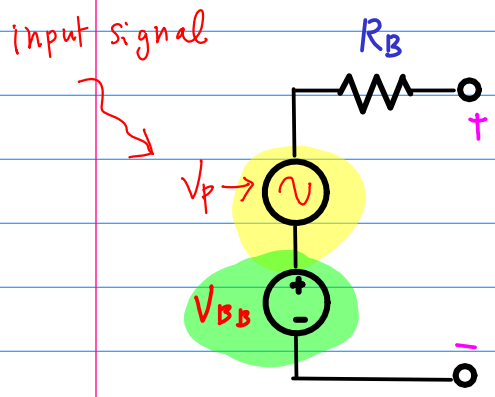
IN- Characteristic

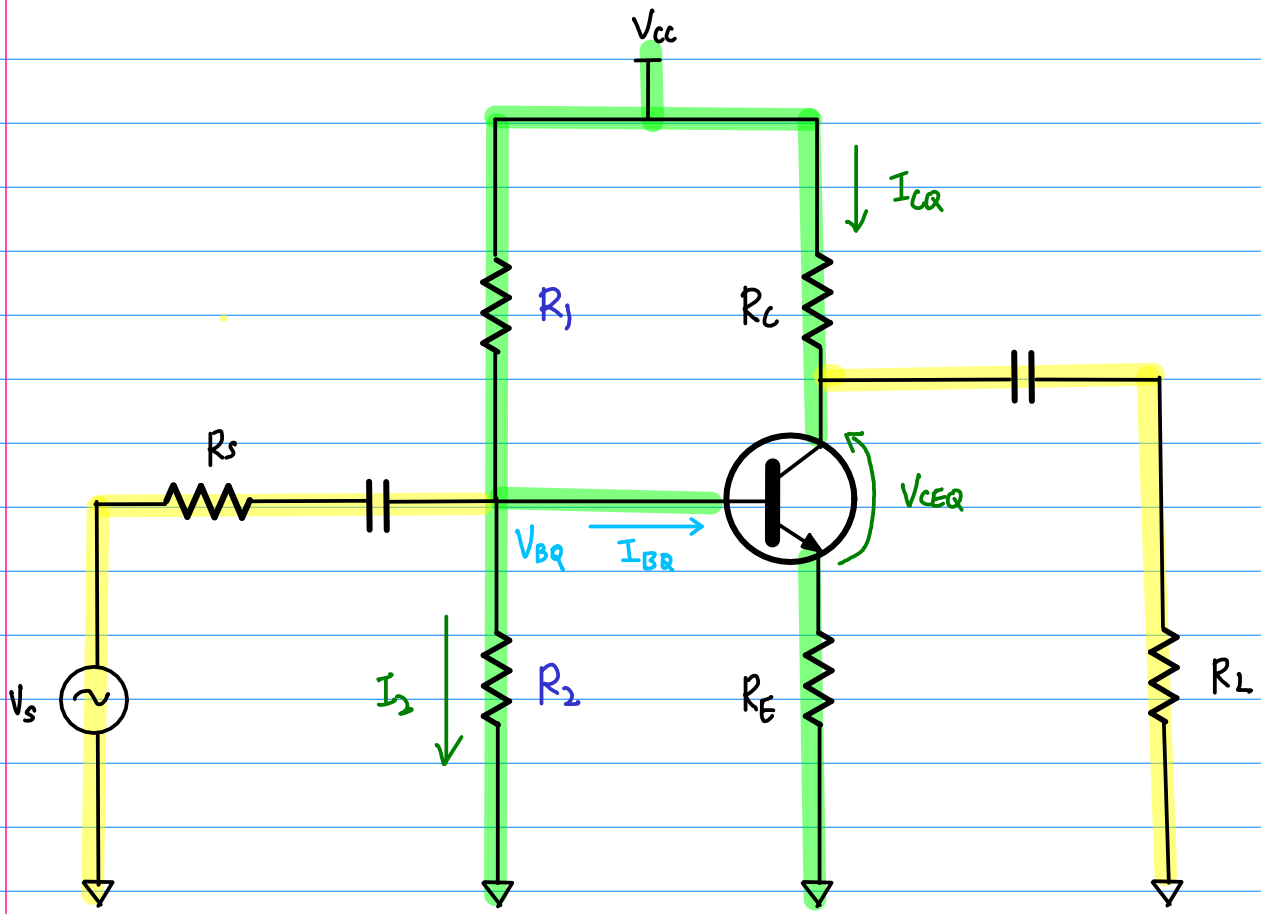


input signal



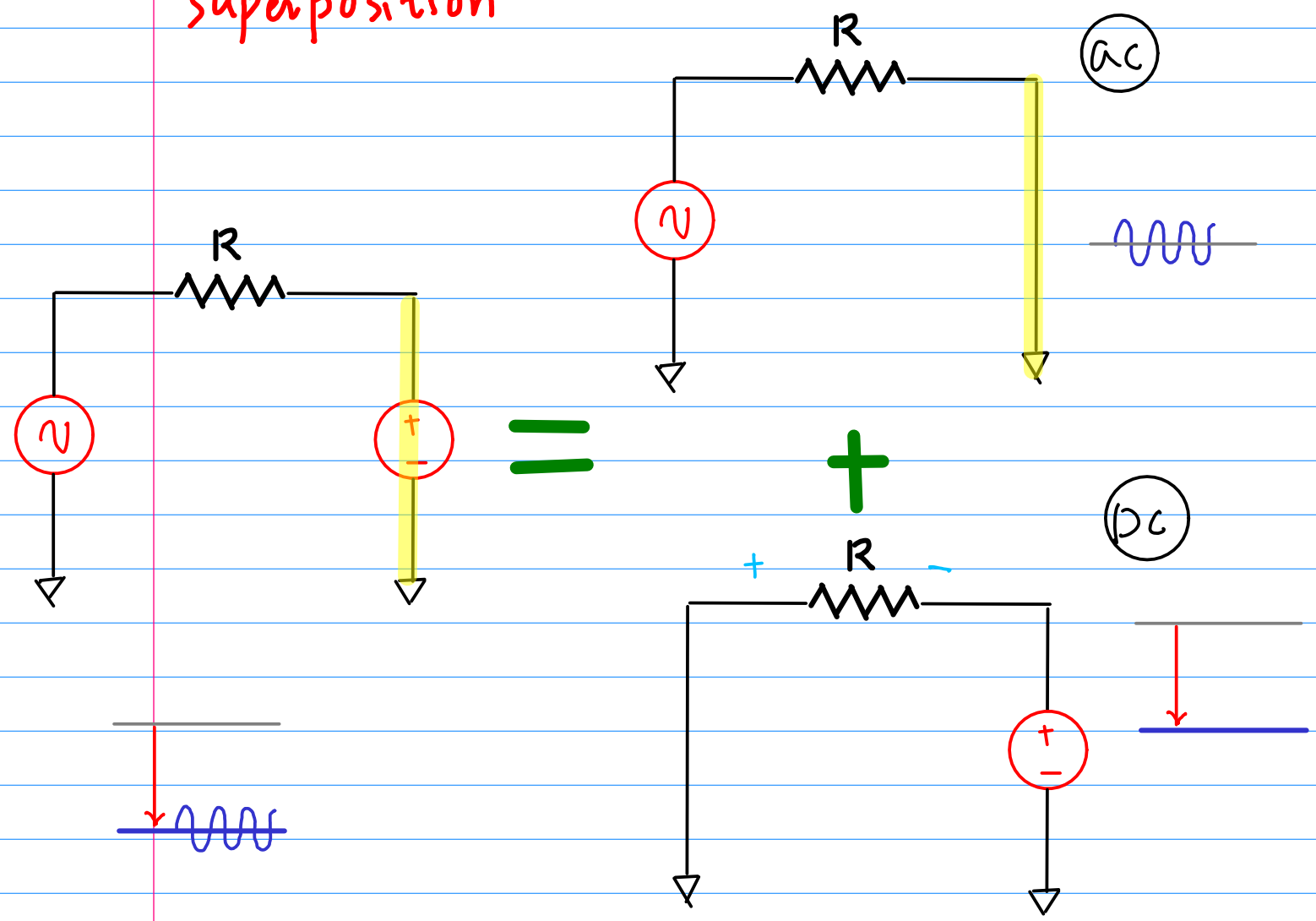


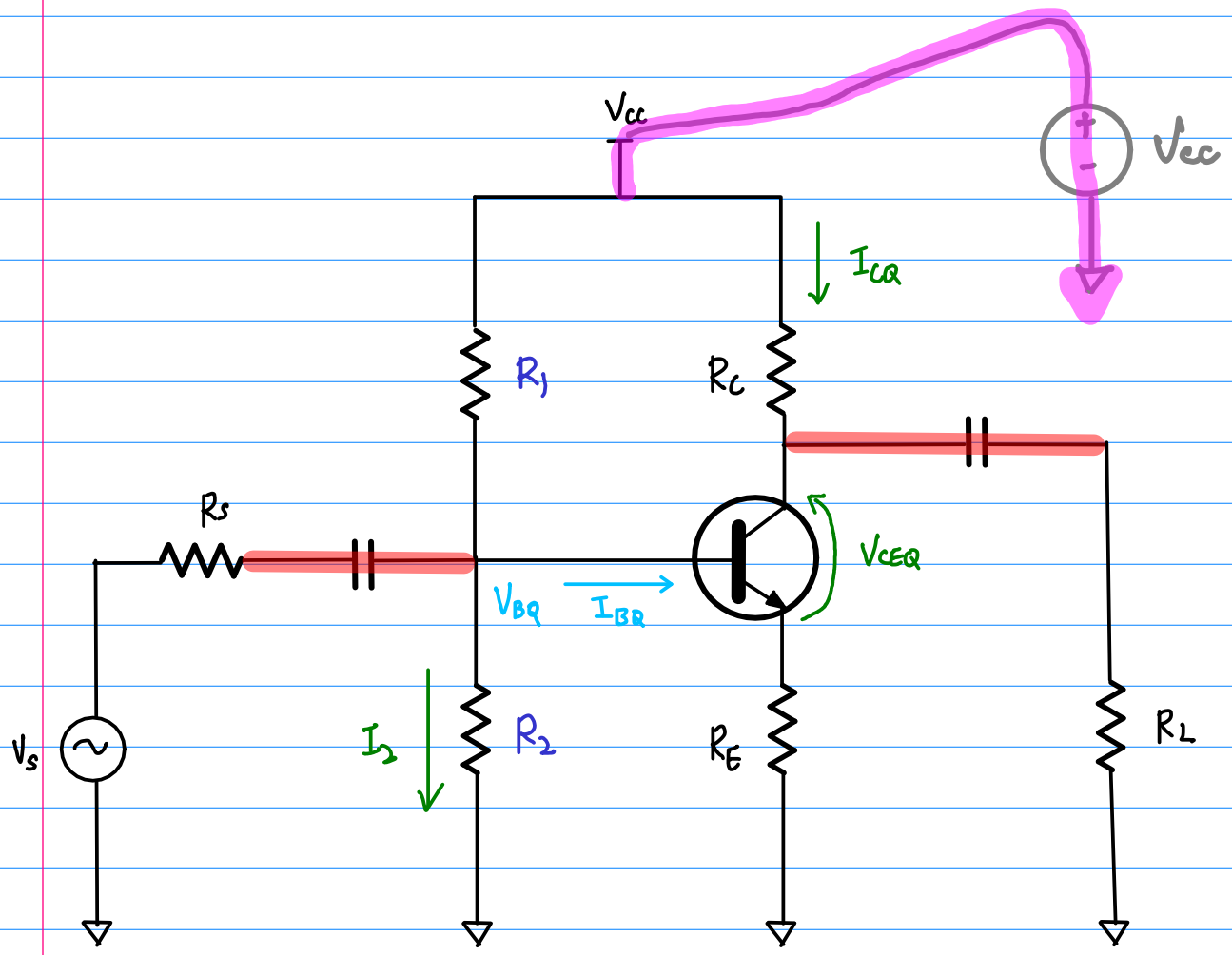

input signal
R_B
+
V_p
V_{BB}
-


V_{CC}
I_{CQ}
R_1
R_C
R_S
V_{CEQ}
V_{BQ}
I_{BQ}
V_s
I_2
R_2
R_E
R_L

DC voltage source ⇒ ac short

Superposition




Vcc
Vcc
ICQ
R1
RC
RS
VCEQ
VBQ
IBQ
I2
R2
RE
RL
Vs