Dept EE, National Tsing Hua University EE2255 Electronics
HW 2 (chapter 4, 5)

Student ID: **Name:**

Notice
(1) Delay is not allowed. (-100pt)
(2) We use LTspice transient analysis to simulate both cases. You must set stop time = 200u and maximum timestep = 1n. (-5pt)
(3) The BJT model is set by the directive: .model NPN NPN(Is=2e-16 Bf=80). (-10pt)
(4) You must attach screenshots of circuit and output waveform. (-10pt)
(5) You must extract the output amplitude by cursor. (-10pt)
(6) Please check the hand-writing result in your photo is clear. (-5pt or -10pt)

1. Fig. 1 shows the common-emitter amplifier with V_{CC} as 2.5 V. V_{in} is a 10 KHz sinusoidal waveform with amplitude equal to 0.5 mV ($V_{p\text{-}p}$ = 1 mV).
   (a) Please design your V_B and R_C to make the voltage gain larger than 10 V/V. Note that voltage gain is the ratio of output amplitude to input amplitude.
   (b) Please check the BJT operates in "active mode," and display it ($V_{CE} > V_{BE} > 0$).
   (c) Please use small signal model to calculate its small signal gain.
   (d) Compare (a) and (c) results.

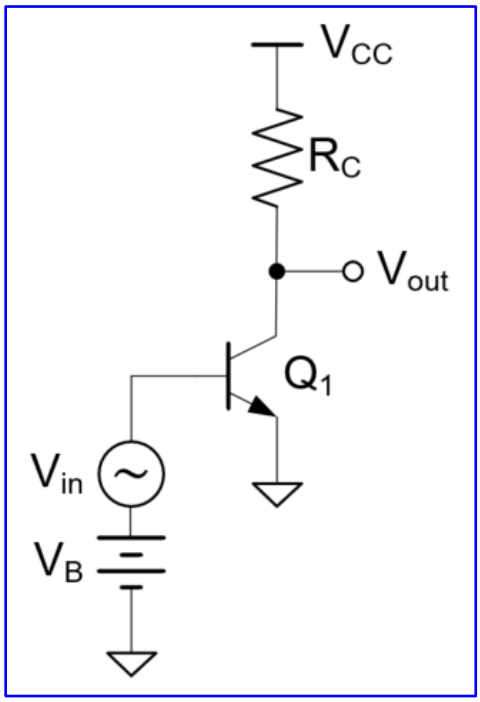


Fig. 1

2. Fig. 2 shows the common-collector amplifier (emitter follower) with V_{CC} as 2.5 V. V_{in} is a 10 KHz sinusoidal waveform with amplitude equal to 0.5 mV ($V_{p\text{-}p}$ = 1 mV).
   (a) Please design your V_B and R_E to make the voltage gain larger than 0.8 V/V. Note that voltage gain is the ratio of output amplitude to input amplitude.
   (b) Please check the BJT operates in "active mode," and display it ($V_{CE} > V_{BE} > 0$).
   (c) Please use small signal model to calculate its small signal gain.
   (d) Compare (a) and (c) results.

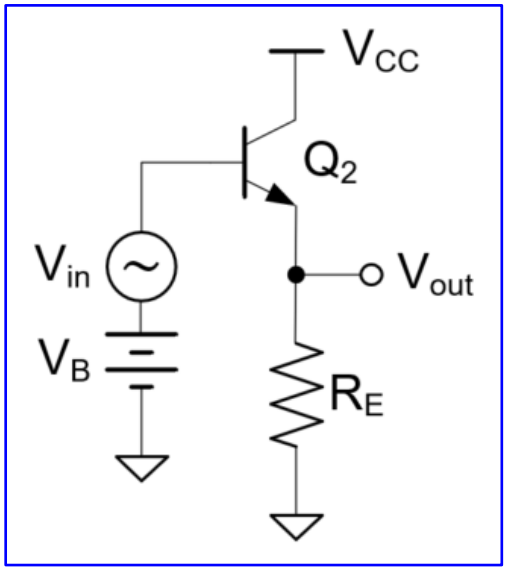
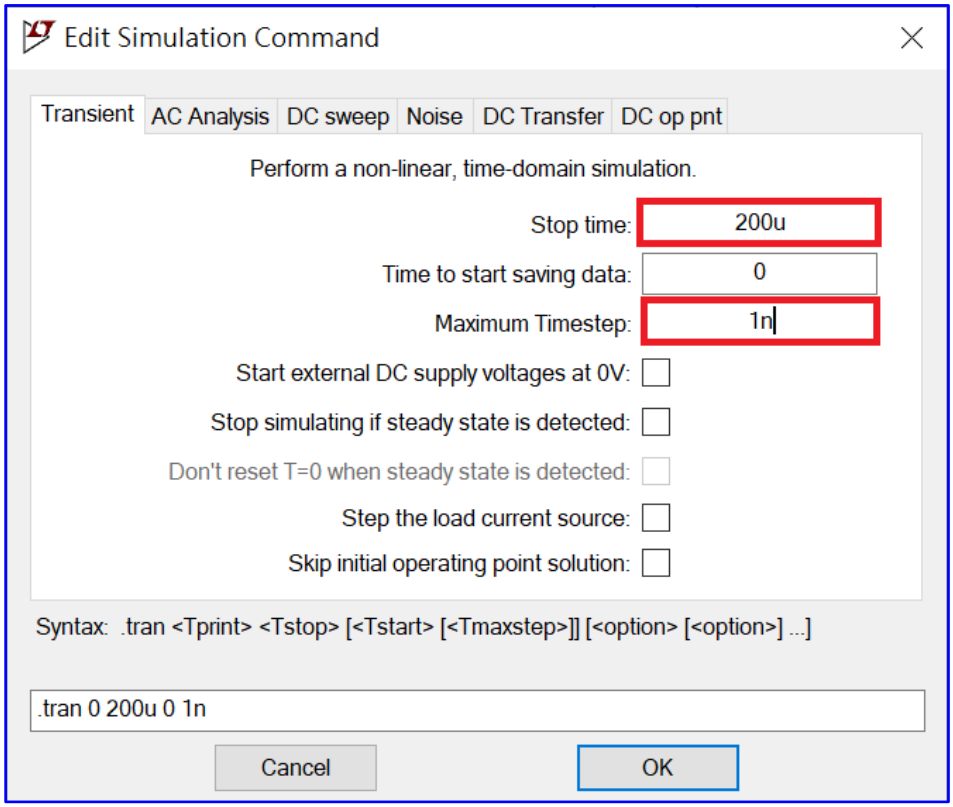


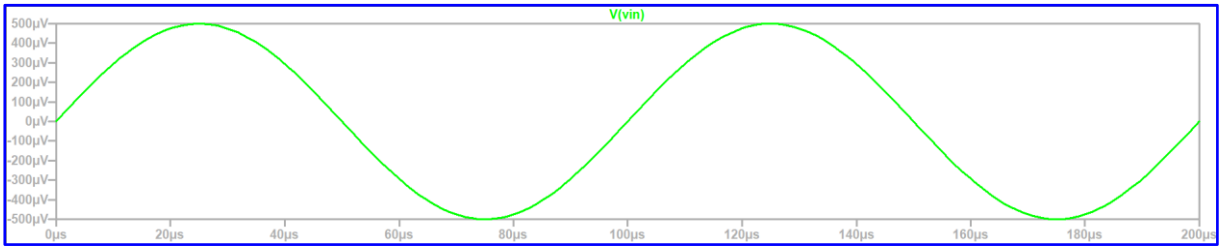
Fig. 2

Appendix

(1) Setup of Transient Analysis



(2) Waveform of Sinusoidal Input



(3) Setup of BJT Model