

ECE-606

Homework No. 8 Assigned: Oct. 30 Due: Nov. 8

- 1) Draw a one-dimensional schematic of an n-p-n transistor identifying the emitter, base, and collector. How many different modes of operation are possible for this bipolar transistor?

For each of the modes that you write, draw the minority carrier concentration profiles in emitter, base, and collector regions of the transistor.

- 2) Solve SDF 11.11
- 3) Solve SDF 14.9
- 4) Prepare a sketch for an **n-p-n** and **p-n-p** BJT that is equivalent to a single **p-n-p** BJT. Why is such a double transistor configuration needed?
- 5) Using the **Ebers-Moll** model, derive an expression for the emitter-collector voltage for a silicon **n-p-n** BJT which is biased in to saturation.
- 6) The E-B junction of an n-p-n transistor is forward biased by V_{BE} , while the collector terminal is kept floating. Using this information, answer the following questions.
 - a) What is the open circuit voltage developed across the C-B junction?
 - b) What is the mode of operation of this transistor?
 - c) What is the value of V_{CE} at this point?
- 7) Prove that the output conductance in the common base configuration is smaller than that in emitter configuration.