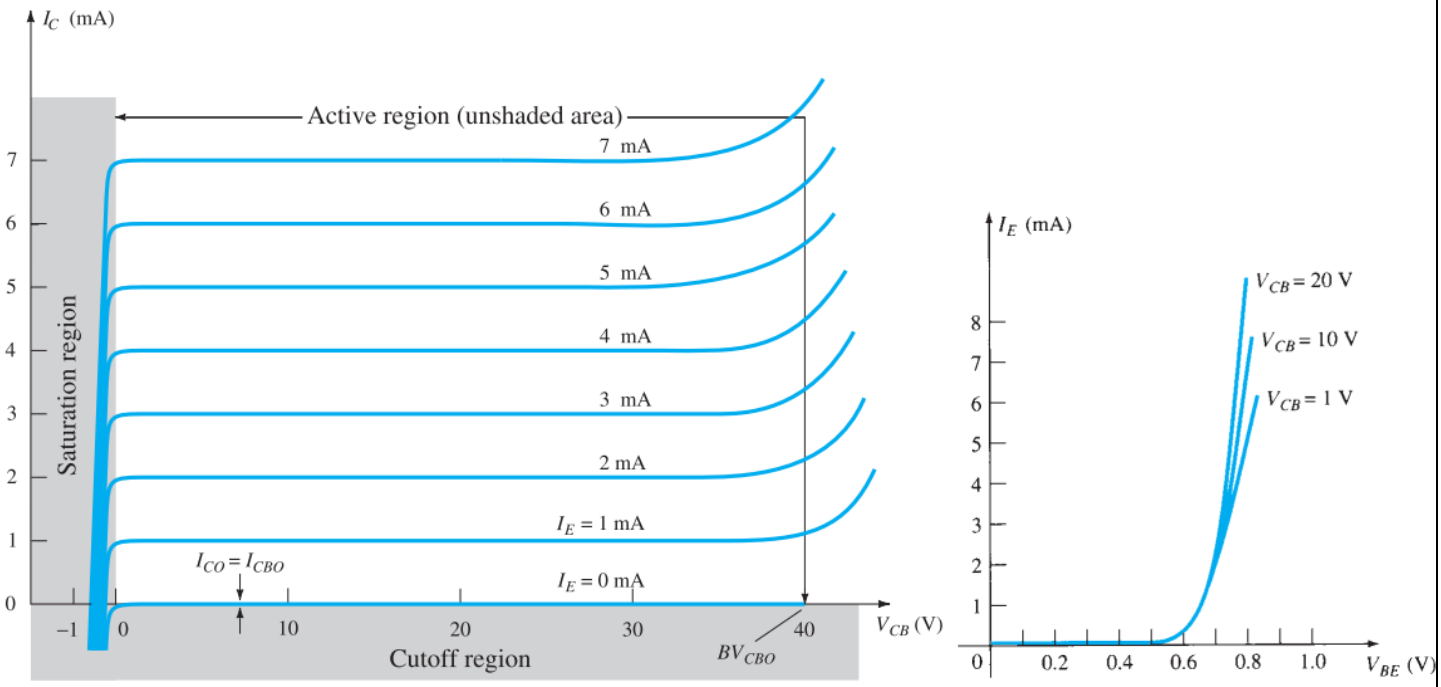
KING FAISAL UNIVERSITY
COLLEGE OF ENGINEERING
DEPARTMENT OF ELECTRICAL ENGINEERING

Course Code / Title: BME 310 –Bio-Electronics I **Semester / Year**: Fall /2019
Homework Assignment #: 3 **Date**: 23/10/2019 **Due Date:** 3/11/2019
Instructor: Dr. Mohammed Morsy Farag

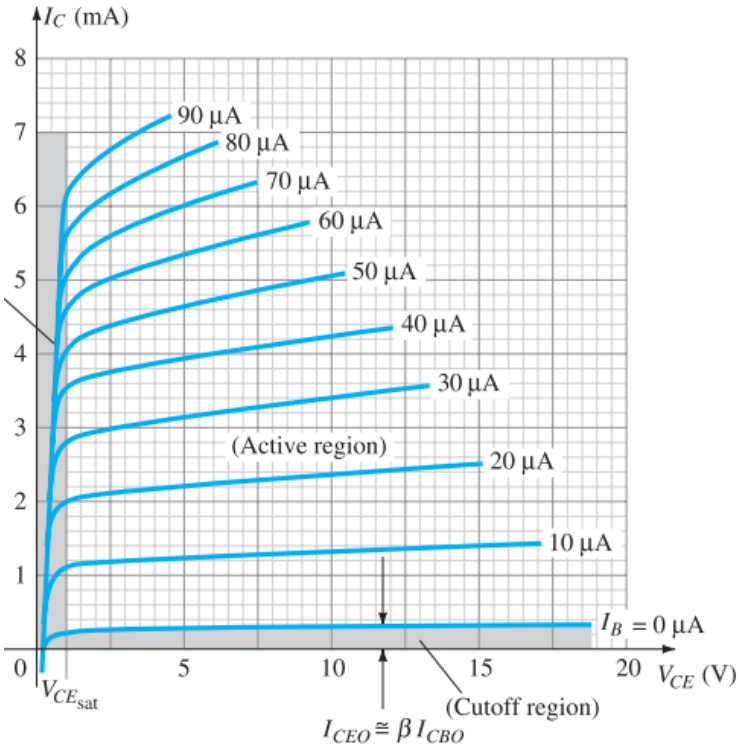
1. Find the following for a transistor in the Common-Base Configuration
   a. Using the characteristics of Fig. P1, determine the resulting collector current if I_E =3.5 mA and V_{CB}=10 V.
   b. Repeat part (a) for I_E = 3.5 mA and V_{CB} = 20 V.
   c. How have the changes in V_{CB} affected the resulting level of I_C?
   d. On an approximate basis, how are I_E and I_C related based on the results above?

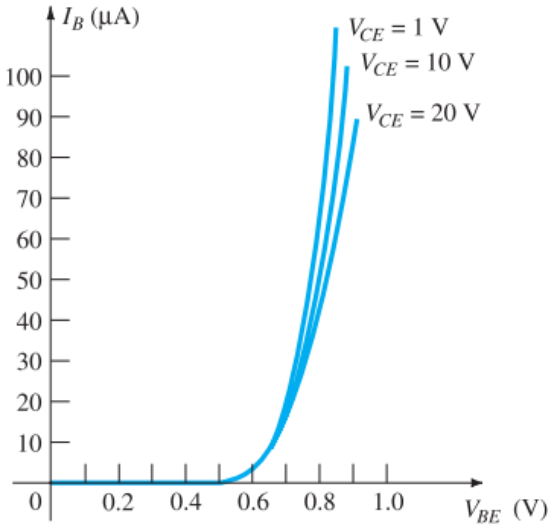


2.
   a. Using the characteristics of Fig. P1, determine I_C if V_{CB} = 5 V and V_{BE} = 0.7 V.
   b. Determine V_{BE} if I_C = 5 mA and V_{CB} = 15 V.

3. Find the following for a transistor in the Common-Base Configuration
   a. Given α_{dc} of 0.998, determine I_C if I_E = 4 mA.
   b. Determine α_{dc} if I_E = 2.8 mA, I_C = 2.75 mA and I_{CBO} = 0.1 μA.

4. Using the characteristics of Figure P4 for a transistor in the Common-Emitter Configuration:
   a. Find the value of I_C corresponding to V_{BE} = +750 mV and V_{CE} = +4 V.
   b. Find the value of V_{CE} and V_{BE} corresponding to I_C = 3.5 mA and I_B = 30 μA.





5. For the common-emitter characteristics of Fig. P4
   a. Find β_{dc} at an operating point of V_{CE} = 6 V and I_C = 2 mA.
   b. Find the value of α corresponding to this operating point.
   c. At V_{CE} = +6 V, find the corresponding value of I_{CEO}.
   d. Calculate the approximate value of I_{CBO} using β_{dc} value obtained in part (a).

6. Using the characteristics of Fig. P4:
   a. Determine I_{CEO} at V_{CE} = 10 V.
   b. Determine β_{dc} at I_B = 10 μA and V_{CE} = 10 V.
   c. Using β_{dc} determined in part (b), calculate I_{CBO}.

7. Using the characteristics of Fig.P4, determine β_{dc} at I_B = 25 μA and V_{CE} = 10 V. Then calculate α_{dc} and the resulting level of I_E.

8. For a BJT in the common-emitter configuration:
   a. Given that α_{dc} = 0.980, determine the corresponding value of β_{dc}.
   b. Given β_{dc} = 120, determine the corresponding value of α.
   c. Given that β_{dc} = 120 and I_C = 2.0 mA, find I_E and I_B.

9. An input voltage of 2 V rms (measured from base to ground) is applied to the circuit of Fig. P9. Assuming that the emitter voltage follows the base voltage exactly and that V_{be}(rms) = 0.1 V, calculate the circuit voltage amplification ($A_v = V_o/V_i$) and emitter current for R_E = 1 kΩ.