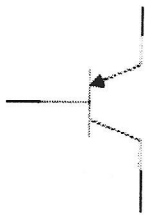
CMPE 314 Midterm Exam 2

(November 10, 2016)

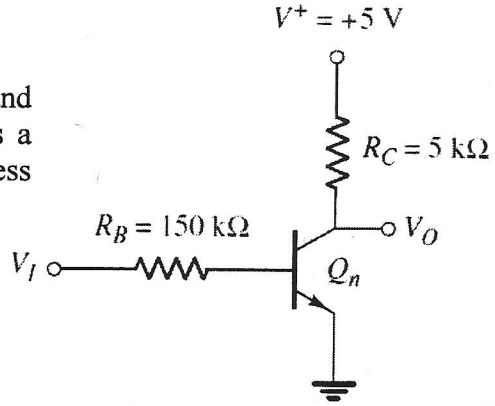
Problem 1 (10 points)

For the transistor shown, draw the internal structure and show power supply connections and conditions on polarity and magnitude in the forward-active mode. Describe actions of carriers (specify types and directions) in different regions.



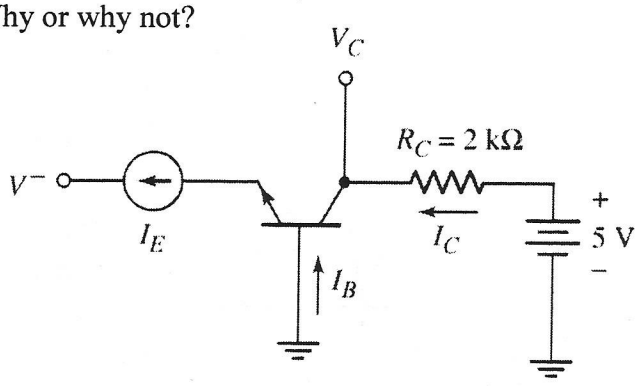
Problem 2 (15 points)

Assume the transistor has its properties β, V_{BE}(on), and V_{CE}(sat), and V^+ is fixed. Determine the output V_O as a function of the input V_I for a large range of V_I. Express results in terms of symbols.



Problem 3 (20 points) values

For the transistor shown in the circuit, β=80, V_{BE}(on)=0.7 V, V_{CE}(sat)=0.2 V. Let I_E=1.2 mA. Determine the power dissipated by the transistor. Is the transistor in the forward-active mode? Why or why not?



Problem 4 (25 points)

(a) Find the DC load-line.

(b) Assume finite V_A. Draw the small-signal circuit with the transistor hybrid-π model.

(c) Find the AC load-line. Plot the Q-point, DC loadline and AC loadline (indicate loadline slopes) in the i_C vs v_{CE} diagram.

(d) Find the maximum and minimum possible values of v_{CE} without distortion for small-signal amplification. (Work with symbols for Problem 4)