

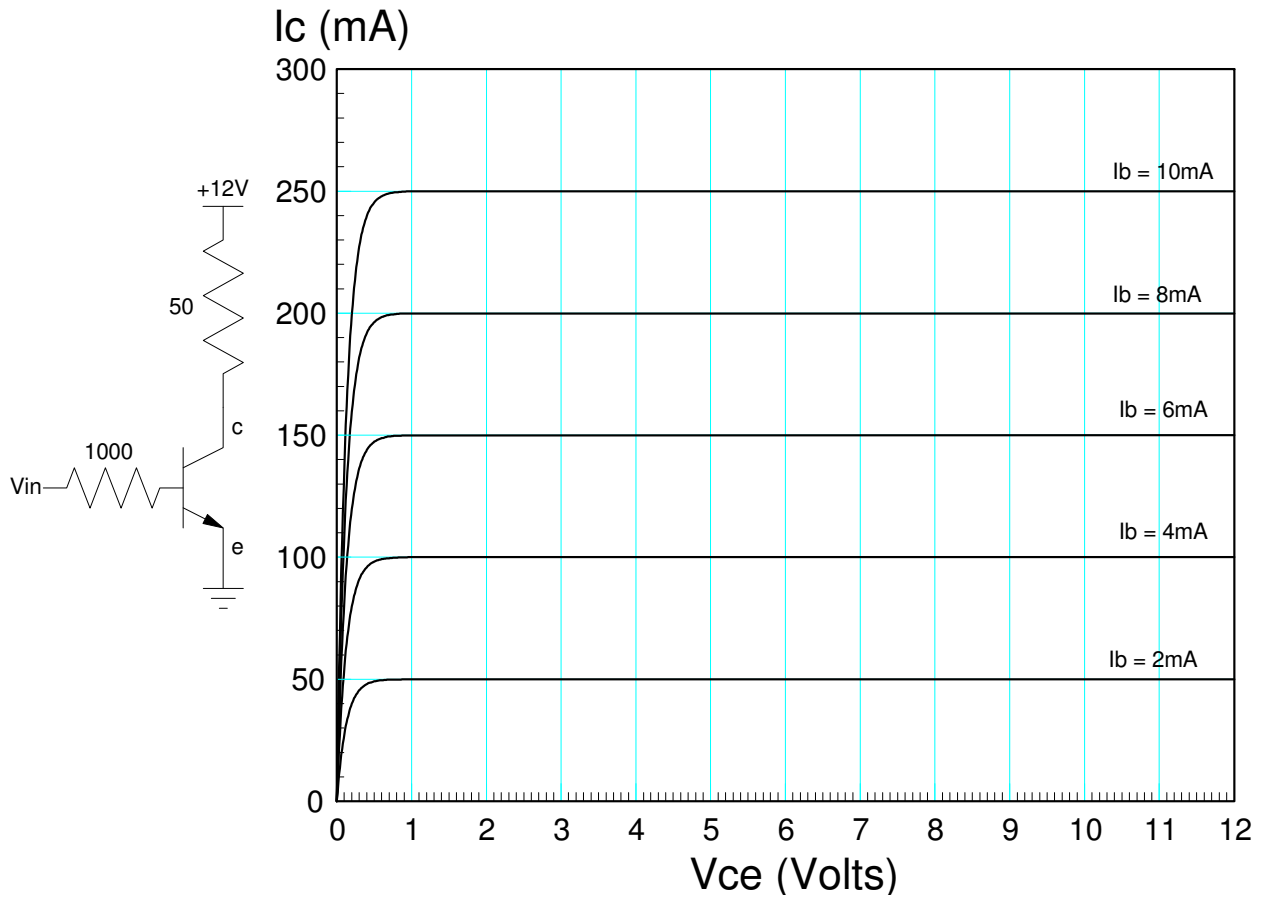
ECE 320 - Homework #5

Transistors, Transistors Used as a Switch. Due Monday, Feb 11th, 2019

Transistors

1) For the following transistor circuit and VI characteristics for the transistor, determine

- The current gain, β
- The load line
- The operating point for $V_{in} = \{0V, 5V, 10V, 15V\}$



Problem 6: Transistor Circuit and VI Characteristics

Problem 2 - 3: Assume a TIP112 transistor (NPN) and TIP117 (PNP) (\$0.34 each)

- $\beta = 1000$
- $\min(|V_{ce}|) = 0.9V$
- $\max(I_c) = 4A$

2) Design a circuit to meet the following requirements (i.e. a transistor used as a switch)

- Input: 0V / 5V binary signal capable of 20mA
- Output: DC Motor which draws 200mA @ 10V
- Relationship:
- When $V_{in} = 0V$, 0V is applied to the motor
- When $V_{in} = 5V$, 10V is applied to the motor +/- 1V

3) Check your design in PartSim

- Model the motor as a 20 Ohm resistor (200mA @ 10V)
- When $V_{in} = 0V$, is 0A flowing in the motor?
- When $V_{in} = 5V$, is 200mA flowing through the motor (i.e. the 20 Ohm resistor)?

4) Check your design in lab.

- When $V_{in} = 0V$, are the voltages and currents what you calculated and simulated?
- When $V_{in} = 5V$, are the voltages and currents what you simulated?

$V_{in} = 0V$ (off)	Calculated problem 2	Simulated problem 3	Measured problem 4
V_{in}	0.0V		
V_{be}			
V_{ce}			
I_c			

$V_{in} = 5V$ (on)	Calculated problem 2	Simulated problem 3	measured problem 4
V_{in}	5.0V		
V_{be}			
V_{ce}			
I_c			