ECE 2100 homework # 17 Due: Wed, 3/26/03

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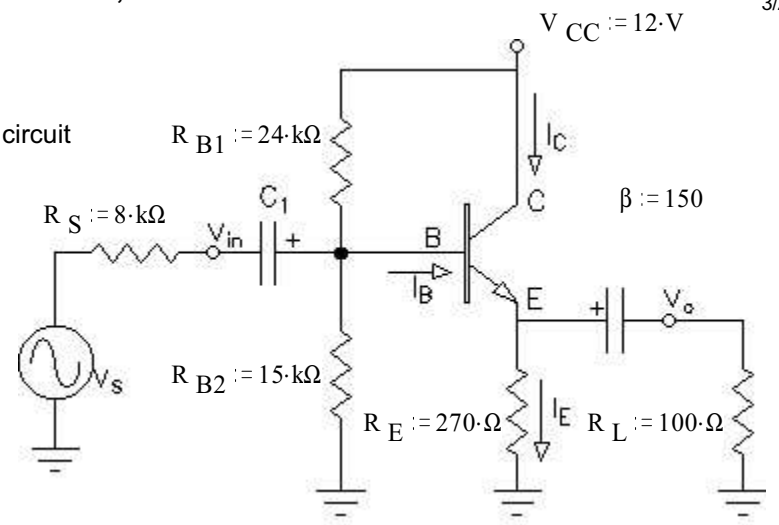
3/28/02

Common Collector

1. Find the following, do not neglect I_B.
   Bias:
   a) The Thevenin equivalent of the base bias circuit

   V_{BB} = ? R_{BB} = ?

   b) I_B = ? I_C = ?



   Small signal characteristics
   You may assume that the coupling capacitors are adequately sized, meaning that you can neglect them in your small signal calculations.

   c) r_e = ? don't neglect r_e in the following calculations

   d) Input resistance, R_{in} , include R_L in this calculation

   e) Output resistance, R_o , include R_s in this calculation

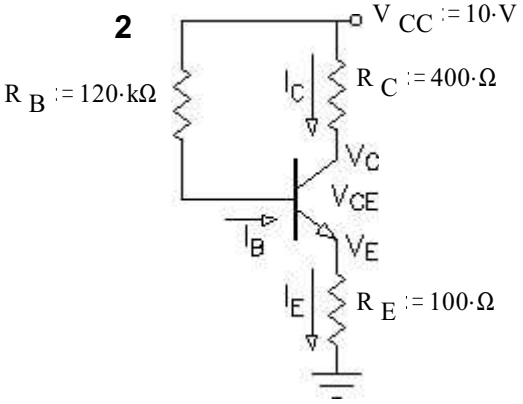
Common Collector Bias (The circuits in the following problems were designed for good bias at β = 150)

2. at β = 150, I_B = 69 μA, I_C = 10.3 mA, V_C = 5.9 V,

   a) Calculate I_B, I_C, and V_C for β = 100

   b) Calculate I_B, I_C, and V_C for β = 400. Check V_{CE} to make sure the transistor is not in saturation. Recalculate I_B, I_C, and V_C if it is.

2



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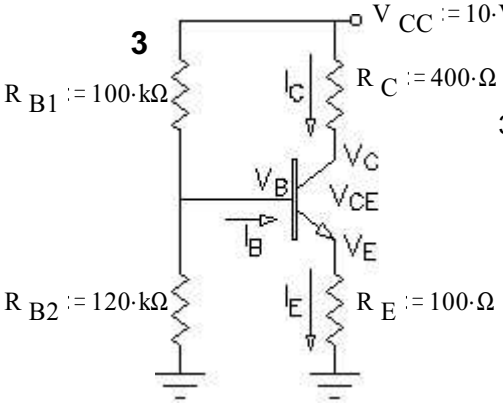
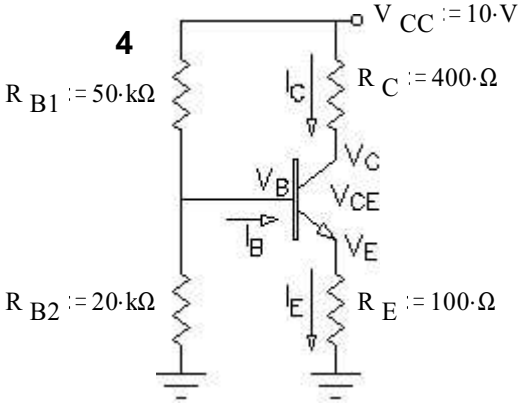


3. at β = 150, I_B = 68.4 μA, I_C = 10.3 mA, V_C = 5.9 V

   a) Calculate I_B, I_C, and V_C for β = 100

   b) Calculate I_B, I_C, and V_C for β = 400. Check V_{CE} to make sure the transistor is not in saturation. Recalculate I_B, I_C, and V_C if it is.

4



4. at β = 150, I_B = 74 μA, I_C = 11 mA, V_C = 5.6 V

   a) Calculate I_B, I_C, and V_C for β = 100

   b) Calculate I_B, I_C, and V_C for β = 400. Check V_{CE} to make sure the transistor is not in saturation. Recalculate I_B, I_C, and V_C if it is.

Answers

1.a) 4.62 V 9.23 kΩ b) 79 μA 11.8 mA c) 2.12 Ω d) 5.07 kΩ e) 27.6 Ω

2. a) at β = 100, I_B = 71.5 μA, I_C = 7.15 mA, V_C = 7.14 V b) at β = 400, I_B = 61.2 μA, I_C = 19.6 mA, V_C = 2.16 V

3. a) at β = 100, I_B = 73.7 μA, I_C = 7.37 mA, V_C = 7.05 V b) at β = 400, I_B = 51.2 μA, I_C = 19.6 mA, V_C = 2.16 V

4. a) at β = 100, I_B = 89 μA, I_C = 8.9 mA, V_C = 6.45 V b) at β = 400, I_B = 40 μA, I_C = 16 mA, V_C = 3.6 V