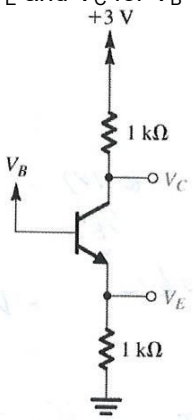
19EEE114 Electronic Circuits

Assignment #4

Due on: 4th May 2022

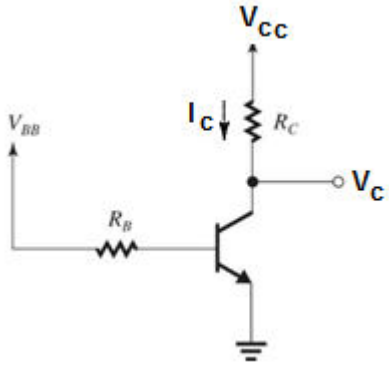
Q1. The Transistor in the circuit below has a very high β, Find V_E and V_C for V_B = +2.0V.



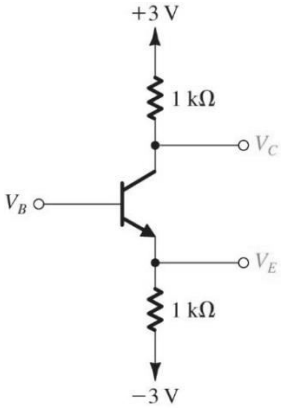
Q2. For the circuit below let V_{CC} = 10 V, R_C = 1 kΩ, and R_B = 10 kΩ. The bipolar junction transistor has β = 50. Find the values of V_{BB} that results in the transistor operating

(a) in the active mode with V_C = 2 V;
(b) at the edge of saturation;
(c) deep in saturation with βforced = 10.

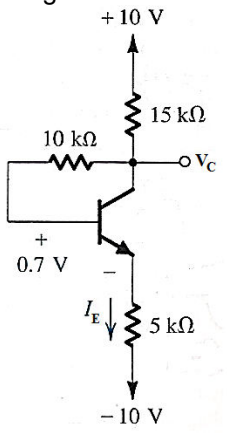
Assume $V_{BE} \approx$ 0.7 V.



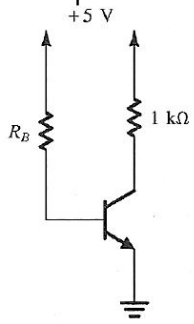
Q3. Consider the operation of the circuit shown below for V_B at -1 V, 0 V, and +1 V. Assume that β is very high. What values of V_E and V_C result? What is the mode of operation of transistor in each case.



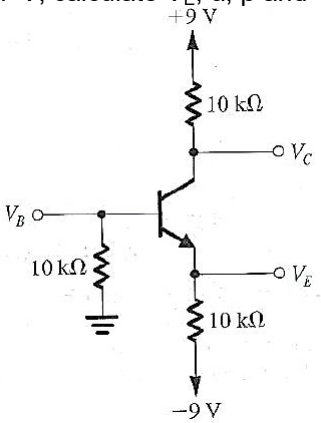
Q4. For the circuit shown below, assume that the transistor has very large β. Find the values of the labeled voltages and current.



Q5. For the circuit shown, design a value for R_B so that the transistor saturates with an overdrive factor of 10. The BJT is specified to have a minimum β of 20 and V_{CEsat} = 0.2 V. What is the value of forced β achieved?



Q6. For the circuit shown, V_B = -1.5 V. Assuming V_{BE} = 0.7 V, calculate V_E, α, β and V_C.



Q7. A transistor with β = 120 is biased to operate at a DC collector current of 1.2mA. Find the values of gm, rπ, and re.

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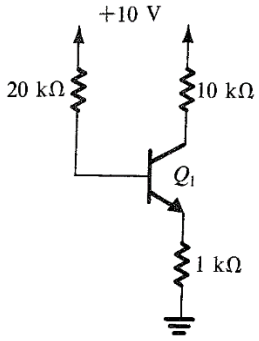
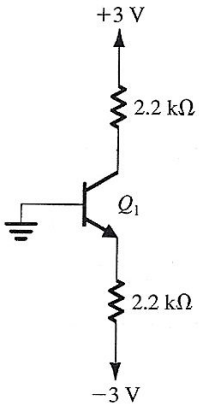
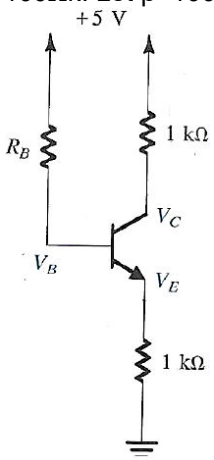
Q8. Find the collector voltage in the circuit shown below. Also, calculate forced β for the transistor. Assume the transistor is operating in saturation.



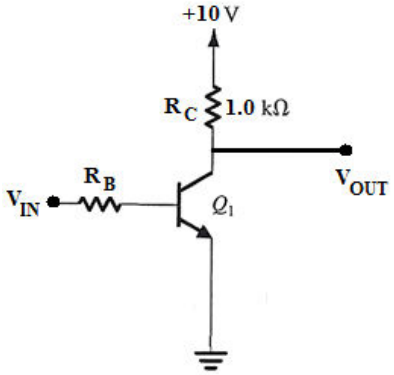
Q9. Consider the circuit shown below. Find the emitter, base and collector voltages and currents. Use β=50, but assume $|V_{BE}|$ = 0.8 V independent of current level.



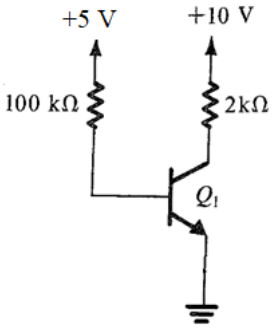
Q10. For the circuit shown below, find V_B, V_E and V_C for R_B = 100Ωk. Let β=100.



Q11. (a) For the transistor circuit shown, what is V_{CE} when V_{IN} = 0 V?
(b) What minimum value of I_B is required to saturate this transistor if β_{DC} is 200? Neglect $V_{CE(sat)}$.
(c) Calculate the maximum value of R_B when V_{IN} = 5 V.



Q12. Determine the voltage at all nodes and current through the branches. Assume β=100.



Q13. Determine the voltage at all nodes and current through the branches. Assume β=100.