JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY
Electronics and Communication Engineering
Electrical Science-II (15B11EC211)
Tutorial Sheet: 13

Q1. [CO4] Consider an npn transistor with v_{BE}=0.7V at i_c=1mA. Find v_{BE} at i_c=0.1mA and 10mA.

(Ans: 0.64V, 0.76V)

Q2. [CO4] Transistor of a certain types are specified to have β value in the range 50 to 150. Find the range of their α values.

(Ans: 0.98 to 0.993)

Q3. [CO4] For a pnp transistor having $I_s=10^{-11}$ A and β =100, calculate v_{EB} for ic=1.5A (Ans: 0.669V)

Q4. [CO4] Measurement of an npn BJT in a particular circuit shows the base current to be 14.46μA, the emitter current to be 1.460mA, and the base-emitter voltage to be 0.7V. For these conditions, calculate α, β and I_s.

(Ans: 0.99, 100, $2.94*10^{-15}$ A)

Q5. [CO4] Calculate β for two transistors for which α are 0.99 ad 0.98. For collector currents of 10mA, find the base current of each transistor.

(Ans: 99, 49, 0.1mA, 0.2mA)

Q6. [CO4] What is β_R for a bipolar transistor described by an Ebers-Moll model with $I_{F0}=1.25\times10^{-16}$A, $I_{R0}=2.50\times10^{-16}$A and α_F =0.996? (Ans:0.992)

Q7. [CO4] The transistor in the circuit of fig 1. has β=100 and exhibit a v_{BE} of 0.7V at i_C=1mA. Design the circuit so that a current of 2mA flows through the collector and a voltage of +5V appears at the collector. (Ans: R_c=5kΩ, R_E=7.07kΩ)

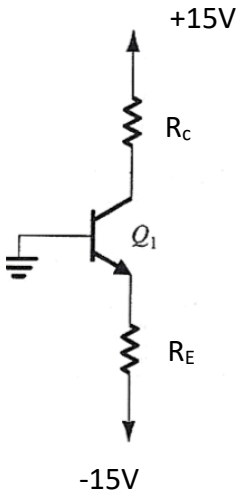

Fig 1

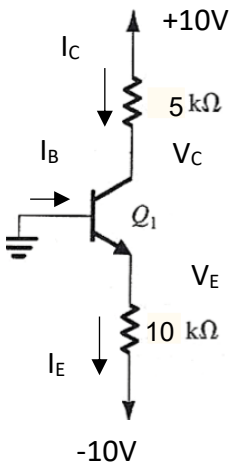

Fig 2

Q8.[CO4] In the circuit shown in Fig 2., the voltage at the emitter was measured and found to be -0.7V. If β=50, find I_E, I_B, I_C, and V_C. (Ans:0.93mA, 18.2μA, 0.91mA, +5.45V)

Q9. [CO4]In the circuit shown in Fig3., assume transistor have very large β value, some measurements have been made on the circuit, with the results indicate in the figure. Find the values of the other labelled voltages and currents.

(Ans: $I_c=I_E=I_5=0.965$mA, $V_6=-4.475$V)

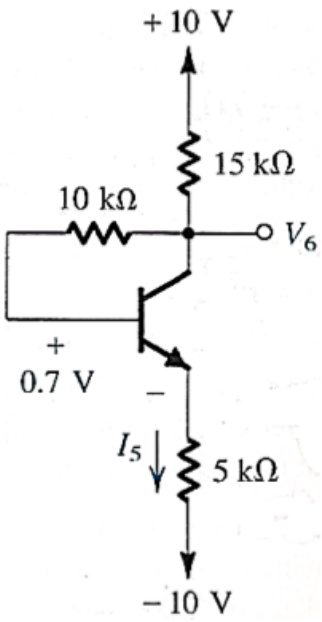

Fig 3.

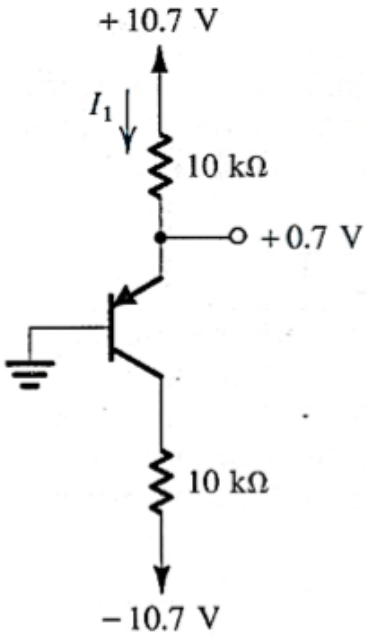

Fig 4.

Q10. [CO4]For the circuit shown in fig 4., assume transistor have very large β value, some measurements have been made on the circuit, with the results indicate in the figure. Find the values of the other labelled voltages and currents.

(Ans: $I_1=I_E=I_c=1$mA, $V_2=-0.7$V)