

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 $\beta=100$, calculate v_{EB} for $i_c=1.5A$

(Ans: 0.669V)

Q4. [CO4] Measurement of an npn BJT in a particular circuit shows the base current to be $14.46\mu A$, 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, $2.94 \times 10^{-15}A$)

Q5. [CO4] Calculate β for two transistors for which α are 0.99 and 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 $I_{F0}=1.25 \times 10^{-16}A$, $I_{R0}=2.50 \times 10^{-16}A$ and $\alpha_F=0.996$? (Ans: 0.992)

Q7. [CO4] The transistor in the circuit of fig 1. has $\beta=100$ 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: $R_c=5k\Omega$, $R_E=7.07k\Omega$)

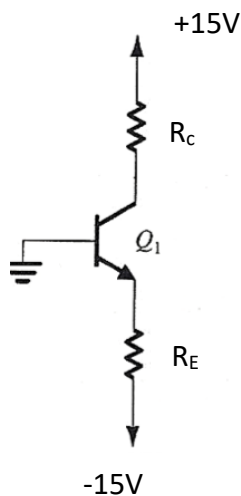


Fig 1

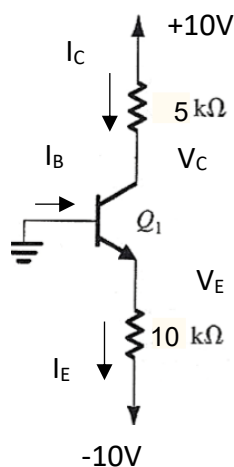


Fig 2

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

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: $I_C=I_E=I_5=0.965\text{mA}$, $V_6=-4.475\text{V}$)

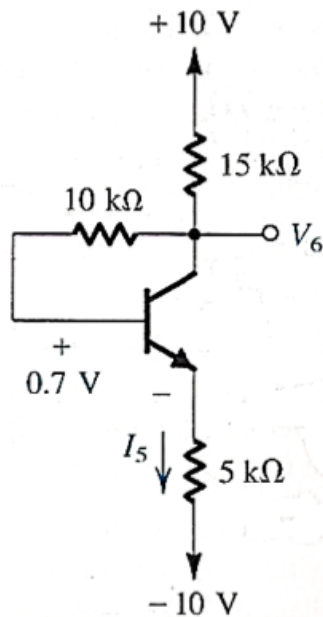


Fig 3.

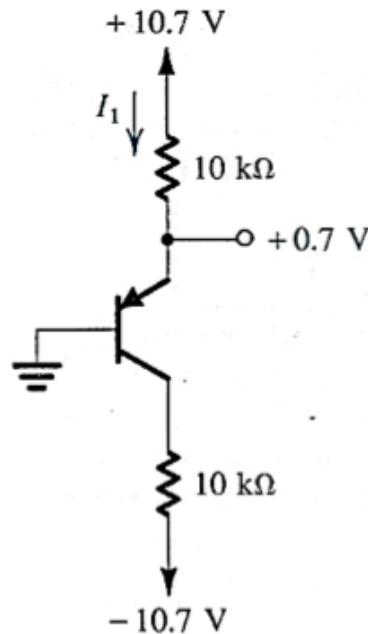


Fig 4.

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: $I_1=I_E=I_C=1\text{mA}$, $V_2=-0.7\text{V}$)