Tutorial # 05

Transistor Biasing:

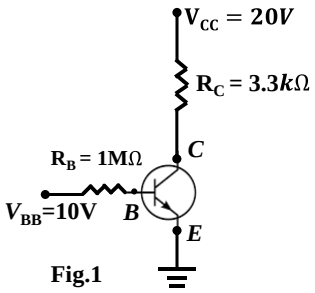

Fig.1

1. For the given circuit in Fig.1,
   a) Draw the load line,
   b) Calculate $I_{C(sat.)}$,
   c) Calculate $V_{CE(cutoff)}$,
   d) What happens to the load line if (*i*) V_{cc} enhanced to 25V, (*ii*) R_C increased to 4.7kΩ and (*iii*) R_B reduced to 500 kΩ. In each of these cases, other parameters of the circuit remain the same.
   e) For $\beta_{DC} = 200$, determine V_C.
   f) If β_{DC} varies between 25 to 300 then determine $V_{C(max)}$ and $V_{C(min)}$.
   g) Determine whether the transistor is saturated for each of these changes: (*i*) R_B=33 kΩ, $\beta_{DC} = 100$. (*ii*) V_{BB}=5V, $\beta_{DC} = 200$, (*iii*) R_C=10 kΩ, $\beta_{DC} = 50$ and (*iv*) V_{CC}=10V, $\beta_{DC} = 100$.

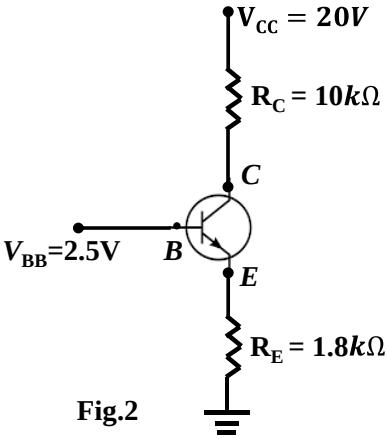

Fig.2

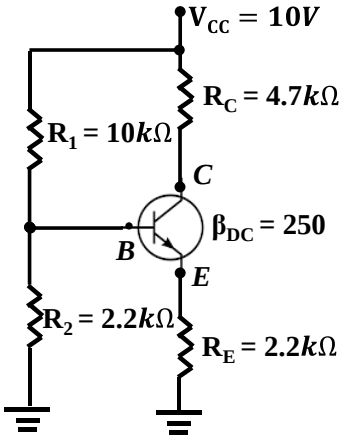

Fig.3

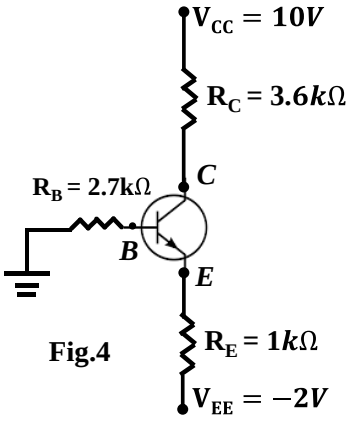

Fig.4

2. For the given circuit in Fig.2,
   a) Determine V_C and V_E.
   b) If $R_E = 3.6$ kΩ then determine V_{CE}.
   c) If $V_{CC} = 15$ V then determine V_C.
   d) If the bae supply voltage V_{BB} decreases by 10%, what happens to the base current, collector current, and collector voltage?

3. For a given voltage-divider bias circuit in Fig.3
   a) Is the voltage divider stiff?
   b) Determine the operating point Q on the load line.
   c) What will happen to this Q-point whenβ_{DC} varies between 50-300?
   d) What will happen to this Q-point when R_E is doubled?

4. For the circuit shown in Fig.3, determine the resistor values (i.e., R_1, R_2, R_E and R_C) to meet these specifications: V_{CC} =10V; V_{CE} @ midpoint, I_C =10mA and β_{DC}=100-300.

5. Analyse the circuit in Fig.4 to locate the Q-point on the load-line.

6. Analyse the given emitter-feedback circuit in Fig.5. How does the operating point change when β_{DC} varies from 100 to 300?
7. Analyse the given collector-feedback circuit in Fig.6. How does the operating point change when β_{DC} varies from 100 to 300? Compare the results of Ques 5 and 6 and suggest which circuit gives better stability of Q-point?
8. Analyse the circuit in Fig.7 and locate the Q-point on the load-line.

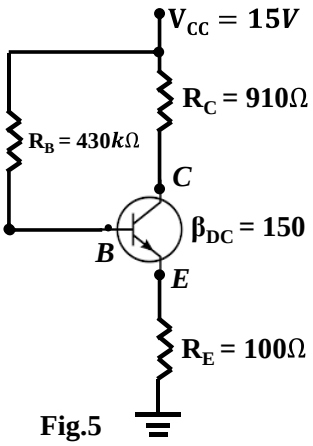

Fig.5

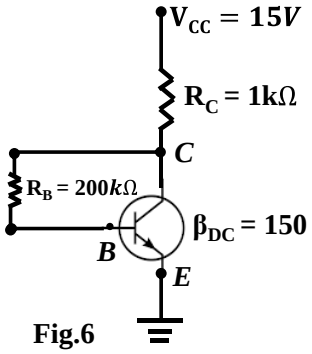

Fig.6

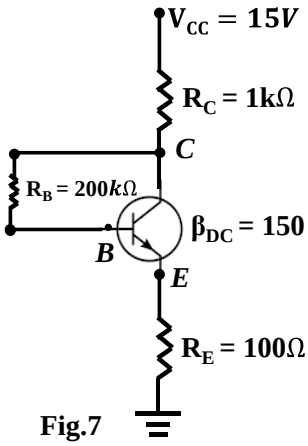

Fig.7