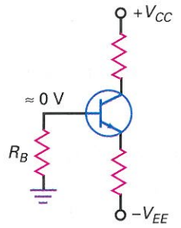
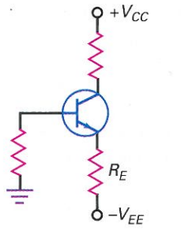
TSEB Derivations

(8-13) Base voltage:



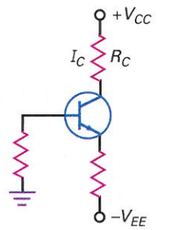
$$V_B \approx 0$$

(8-14) Emitter current:



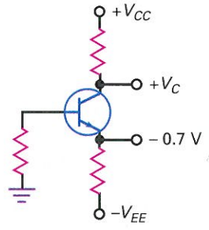
$$I_E = \frac{V_{EE} - 0.7\text{ V}}{R_E}$$

(8-15) Collector voltage (TSEB)



$$V_C = V_{CC} - I_C R_C$$

(8-16) Collector-emitter voltage (TSEB)



$$V_{CE} = V_C + 0.7\text{ V}$$

Student Assignments

1. **For the emitter bias, the voltage across the emitter resistor is the same as the voltage between the emitter and the**
   a. Base c. Emitter
   b. Collector d. Ground

2. **For emitter bias, the voltage at the emitter is 0.7 V less than the**
   a. Base voltage
   b. Emitter voltage
   c. Collector voltage
   d. Ground voltage

3. **With voltage-divider bias, the base voltage is**
   a. Less than the base supply voltage
   b. Equal to the base supply voltage
   c. Greater than the base supply voltage
   d. Greater than the collector supply voltage

4. **VDB is noted for its**
   a. Unstable collector voltage
   b. Varying emitter current
   c. Large base current
   d. Stable *Q* point

5. **With VDB, an increase in collector resistance will**
   a. Decrease the emitter voltage
   b. Decrease the collector voltage
   c. Increase the emitter voltage
   d. Decrease the emitter current

6. **VDB has a stable *Q* point like**
   a. Base bias
   b. Emitter bias
   c. Collector-feedback bias
   d. Emitter-feedback bias

7. **VDB needs**
   a. Only three resistors
   b. Only one supply
   c. Precision resistors
   d. More resistors to work better

8. **VDB normally operates in the**
   a. Active region
   b. Cutoff region
   c. Saturation region
   d. Breakdown region

9. **The collector voltage of a VDB circuit is not sensitive to changes in the**
   a. Supply voltage
   b. Emitter resistance
   c. Current gain
   d. Collector resistance

10. **If the emitter resistance decreases in a VDB circuit, the collector voltage**
    a. Decreases c. Increases
    b. Stays the same d. Doubles

11. **Base bias is associated with**
    a. Amplifiers
    b. Switching circuits
    c. Stable *Q* point
    d. Fixed emitter current

12. **If the emitter resistance is reduced by one-half in a VDB circuit, the collector current will**
    a. Double
    b. Drop in half
    c. Remain the same
    d. Increase

13. **If the collector resistance decreases in a VDB circuit, the collector voltage will**
    a. Decrease
    b. Stay the same
    c. Increase
    d. Double

14. **The *Q* point of a VDB circuit is**
    a. Hypersensitive to changes in current gain
    b. Somewhat sensitive to changes in current gain
    c. Almost totally insensitive to changes in current gain
    d. Greatly affected by temperature changes

15. **The base voltage of two-supply emitter bias (TSEB) is**
    a. 0.7 V
    b. Very large
    c. Near 0 V
    d. 1.3 V

16. **If the emitter resistance doubles with TSEB, the collector current will**
    a. Drop in half
    b. Stay the same
    c. Double
    d. Increase

17. **If a splash of solder shorts the collector resistor of TSEB, the collector voltage will**
    a. Drop to zero
    b. Equal the collector supply voltage
    c. Stay the same
    d. Double

18. **If the emitter resistance decreases with TSEB, the collector voltage will**
    a. Decrease
    b. Stay the same
    c. Increase
    d. Equal the collector supply voltage

19. **If the base resistor opens with TSEB, the collector voltage will**
    a. Decrease
    b. Stay the same
    c. Increase slightly
    d. Equal the collector supply voltage

20. **In TSEB, the base current must be very**
    a. Small
    b. Large
    c. Unstable
    d. Stable

21. **The *Q* point of TSEB does not depend on the**
    a. Emitter resistance
    b. Collector resistance
    c. Current gain
    d. Emitter voltage

22. **The majority carriers in the emitter of a *pnp* transistor are**
    a. Holes
    b. Free electrons
    c. Trivalent atoms
    d. Pentavalent atoms

23. **The current gain of a *pnp* transistor is**
    a. The negative of the *npn* current gain
    b. The collector current divided by the emitter current
    c. Near zero
    d. The ratio of collector current to base current

24. **Which is the largest current in a *pnp* transistor?**
    a. Base current
    b. Emitter current
    c. Collector current
    d. None of these

25. **The currents of a *pnp* transistor are**
    a. Usually smaller than *npn* currents
    b. Opposite *npn* currents
    c. Usually larger than *npn* currents
    d. Negative

26. **With *pnp* voltage-divider bias, you must use**
    a. Negative power supplies
    b. Positive power supplies
    c. Resistors
    d. Grounds

27. **With a TSEB *pnp* circuit using a negative V_{CC} supply, the emitter voltage is**
    a. Equal to the base voltage
    b. 0.7 V higher than the base voltage
    c. 0.7 V lower than the base voltage
    d. Equal to the collector voltage

28. **In a well-designed VDB circuit, the base current is**
    a. Much larger than the voltage divider current
    b. Equal to the emitter current
    c. Much smaller than the voltage divider current
    d. Equal to the collector current

29. **In a VDB circuit, the base input resistance R_{IN} is**
    a. Equal to $\beta_{dc} R_E$
    b. Normally smaller than R_{TH}
    c. Equal to $\beta_{dc} R_C$
    d. Independent of β_{dc}

30. **In a TSEB circuit, the base voltage is approximately zero when**
    a. The base resistor is very large
    b. The transistor is saturated
    c. β_{dc} is very small
    d. $R_B < 0.01\ \beta_{dc} R_E$

Problems

SEC. 8-1 VOLTAGE-DIVIDER BIAS

8-1 MultiSim What is the emitter voltage in Fig. 8-20? The collector voltage?

8-2 MultiSim What is the emitter voltage in Fig. 8-21? The collector voltage?

8-3 MultiSim What is the emitter voltage in Fig. 8-22? The collector voltage?

8-4 MultiSim What is the emitter voltage in Fig. 8-23? The collector voltage?

8-5 All resistors in Fig. 8-22 have a tolerance of ±5 percent. What is the lowest possible value of the collector voltage? The highest?

8-6 The power supply of Fig. 8-23 has a tolerance of ±10 percent. What is the lowest possible value of the collector voltage? The highest?