Alexandria University
Faculty of Engineering
Electrical Engineering Department

ECE: Principles and Applications of Electronic Engineering
Sheet 4

1. A transistor has an emitter current of 10 mA and a collector current of 9.95 mA. What is the base current?
2. The collector current is 10 mA, and the base current is 0.1 mA. What is the current gain?
3. A transistor has a current gain of 150 and a base current of 30 _A. What is the collector current?
4. If the collector current is 100 mA and the current gain is 65, what is the emitter current?

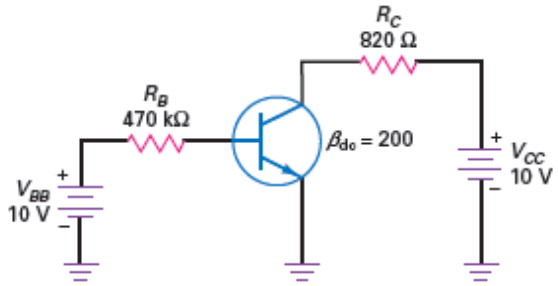

Figure 1

5. What is the base current in Fig. 1?
6. If the current gain decreases from 200 to 100 in Fig. 6-33, what is the base current?
7. A transistor circuit similar to Fig. 1 has a collector supply voltage of 20 V, a collector resistance of 1.5 kΩ, and a collector current of 6 mA. What is the collector-emitter voltage?
8. If a transistor has a collector current of 100 mA and a collector-emitter voltage of 3.5 V, what is its power dissipation?
9. What are the collector-emitter voltage and the transistor power dissipation in Fig.1? (Give answers for the ideal and the second approximation.)

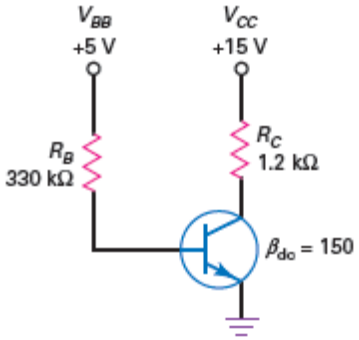

Figure 2

10. Figure 2 shows a simpler way to draw a transistor circuit. It works the same as the circuits already discussed. What is the collector- emitter voltage? The transistor power dissipation? (Give answers for the ideal and the second approximation.)

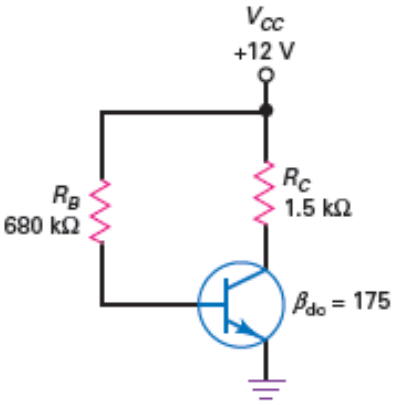

Figure 3

11. When the base and collector supplies are equal, the transistor can be drawn as shown in Fig. 3. What is the collector-emitter voltage in this circuit? The transistor power? (Give answers for the ideal and the second approximation.)

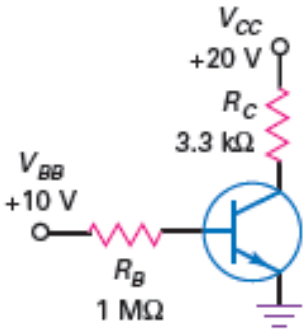

Figure 4

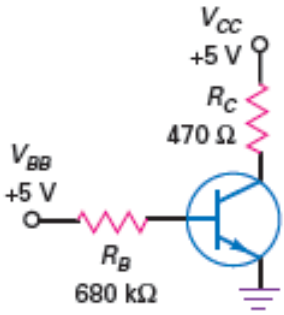

Figure 5

12. Draw the load line for Fig. 4. What is the collector current at the saturation point? The collector-emitter voltage at the cutoff point?
13. If the collector supply voltage is increased to 25 V in Fig.4 , what happens to the load line?
14. If the collector resistance is increased to 4.7 kΩ in Fig. 4, what happens to the load line?
15. If the base resistance of Fig. 4 is reduced to 500 kΩ, what happens to the load line?
16. Draw the load line for Fig. 5. What is the collector current at the saturation point? The collector-emitter voltage at the cutoff point?
17. If the collector supply voltage is doubled in Fig. 5, what happens to the load line?
18. If the collector resistance is increased to 1 kΩ in Fig. 5, what happens to the load line?
19. In Fig. 4, what is the voltage between the collector and ground if the current gain is 200?
20. The current gain varies from 25 to 300 in Fig. 4. What is the minimum voltage from the collector to ground? The maximum?
21. In Fig. 5, what is the voltage between the collector and ground if the current gain is 150?
22. The current gain varies from 100 to 300 in Fig. 5. What is the minimum voltage from the collector to ground? The maximum?

23. In Fig.4 , use the circuit values shown unless otherwise indicated. Determine whether the transistor is saturated for each of these changes:
    a. RB = 33 kΩ and hFE = 100
    b. VBB = 5 V and hFE = 200
    c. RC = 10 kΩ and hFE = 50
    d. VCC = 10 V and hFE = 100

24. In Fig.5, use the circuit values shown unless otherwise indicated. Determine whether the transistor is saturated for each of these changes:
    a. *RB* = 51 kΩ and *hFE* = 100
    b. *VBB* = 10 V and *hFE* = 500
    c. *RC* = 10 kΩ and *hFE* = 100
    d. *VCC* = 10 V and *hFE* = 100