HW II
DE 2019

Seventh Edition

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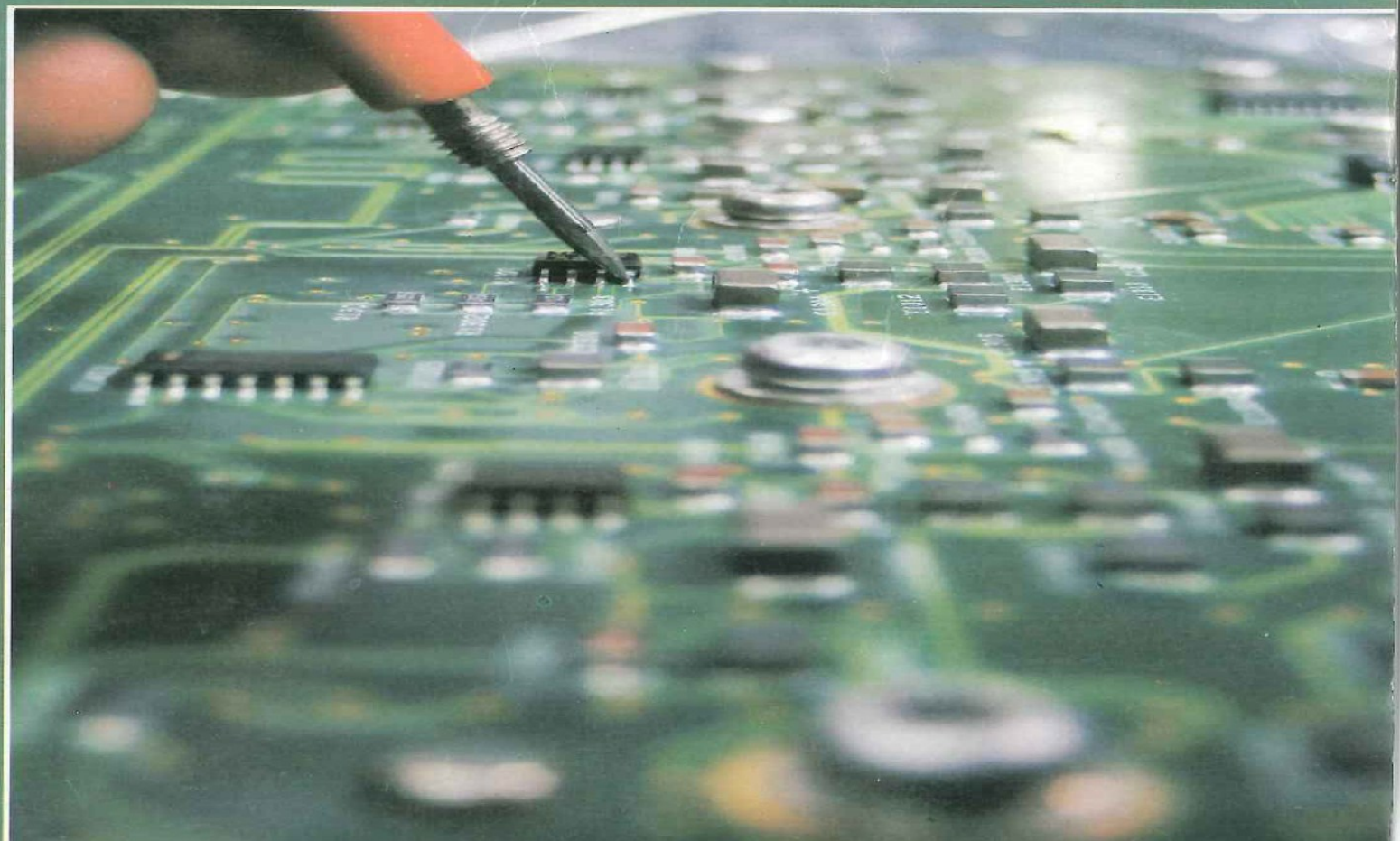
DAVID J. BATES

Electronic Principles



Electronic Principles

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Genap

Problems

SEC. 3–1 BASIC IDEAS

3–1 A diode is in series with 220 Ω. If the voltage across the resistor is 6 V, what is the current through the diode?

3–2 A diode has a voltage of 0.7 V and a current of 100 mA. What is the diode power?

3–3 Two diodes are in series. The first diode has a voltage of 0.75 V and the second has a voltage of 0.8 V. If the current through the first diode is 400 mA, what is the current through the second diode?

SEC. 3–2 THE IDEAL DIODE

3–4 In Fig. 3-22*a*, calculate the load current, load voltage, load power, diode power, and total power.

3–5 If the resistor is doubled in Fig. 3-22*a*, what is the load current?

3–6 In Fig. 3-22*b*, calculate the load current, load voltage, load power, diode power, and total power.

3–7 If the resistor is doubled in Fig. 3-22*b*, what is the load current?

3–8 If the diode polarity is reversed in Fig. 3-22*b*, what is the diode current? The diode voltage?

3–12 If the resistor is doubled in Fig. 3-22*a*, what is the load current?

3–13 If the diode polarity is reversed in Fig. 3-22*b*, what is the diode current? The diode voltage?

SEC. 3–4 THE THIRD APPROXIMATION

3–14 In Fig. 3-22*a*, calculate the load current, load voltage, load power, diode power, and total power. ($R_B = 0.23\ \Omega$)

3–15 If the resistor is doubled in Fig. 3-22*a*, what is the load current? ($R_B = 0.23\ \Omega$)

3–16 In Fig. 3-22*b*, calculate the load current, load voltage, load power, diode power, and total power. ($R_B = 0.23\ \Omega$)

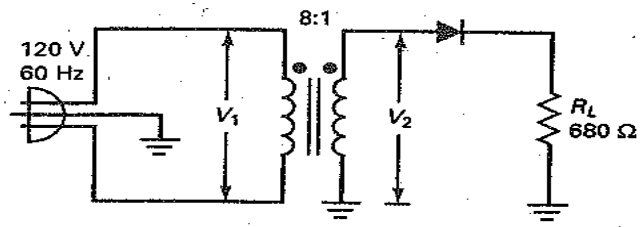
3–17 If the resistor is doubled in Fig. 3-22*b*, what is the load current? ($R_B = 0.23\ \Omega$)

3–18 If the diode polarity is reversed in Fig. 3-22*b*, what is the diode current? The diode voltage?

SEC. 3–5 TROUBLESHOOTING

3–19 Suppose the voltage across the diode of Fig. 3-23*a* is 5 V. Is the diode open or shorted?

Figure 4–37



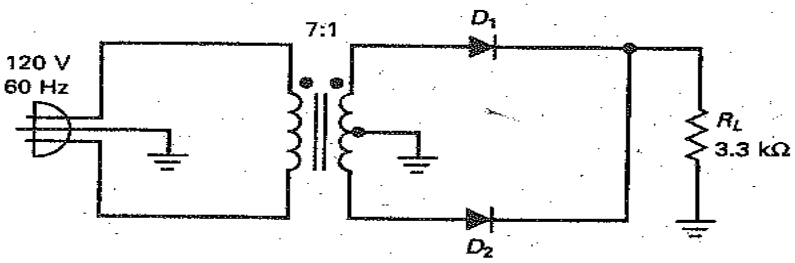
SEC. 4–3 THE FULL-WAVE RECTIFIER

4–9 A center-tapped transformer with 120 V input has a turns ratio of 4 : 1. What is the rms voltage across the upper half of the secondary winding? The peak voltage? What is the rms voltage across the lower half of the secondary winding?

4–10 MultiSim What is the peak output voltage in Fig. 4–38 if the diodes are ideal? The average value? The dc value? Sketch the output waveform.

4–11 MultiSim Repeat the preceding problem using the second approximation.

Figure 4–38



SEC. 4–4 THE BRIDGE RECTIFIER

4–12 MultiSim In Fig. 4–39, what is the peak output voltage if the diodes are ideal? The average value? The dc value? Sketch the output waveform.

4–13 MultiSim Repeat the preceding problem using the second approximation.

4–14 If the line voltage in Fig. 4–39 varies from 105 to 125 V rms, what is the minimum dc output voltage? The maximum?

SEC. 4–5 THE CHOKE-INPUT FILTER

4–15 A half-wave signal with a peak of 20 V is the input to a choke-input filter. If $X_L = 1\ \text{k}\Omega$ and $X_C = 25\ \Omega$, what is the approximate peak-to-peak ripple across the capacitor?

4–16 A full-wave signal with a peak of 14 V is the input to a choke-input filter. If $X_L = 2\ \text{k}\Omega$ and $X_C = 50\ \Omega$, what is the approximate peak-to-peak ripple across the capacitor?

SEC. 4–6 THE CAPACITOR-INPUT FILTER

4–17 What is the dc output voltage and ripple in Fig. 4–40*a*? Sketch the output waveform.

4–18 In Fig. 4–40*b*, calculate the dc output voltage and ripple.

4–19 What happens to the ripple in Fig. 4–40*a* if the capacitance value is reduced to half?

4–20 In Fig. 4–40*b*, what happens to the ripple if the resistance is reduced to 500 Ω?

4–21 What is the dc output voltage in Fig. 4–41? The ripple? Sketch the output waveform.

4–22 If the line voltage decreases to 105 V in Fig. 4–41, what is the dc output voltage?

SEC. 4–7 PEAK INVERSE VOLTAGE AND SURGE CURRENT

4–23 What is the peak inverse voltage in Fig. 4–41?

4–24 If the turns ratio changes to 3 : 1 in Fig. 4–41, what is the peak inverse voltage?

SEC. 4–8 OTHER POWER-SUPPLY TOPICS

4–25 An F-25X replaces the transformer of Fig. 4–41. What is the approximate peak voltage across the secondary winding? The approximate dc output voltage? Is the transformer being operated at its rated output current? Will the dc output voltage be higher or lower than normal?

4–26 What is the primary current in Fig. 4–41?

4–27 What is the average current through each diode in Fig. 4–40*a* and 4–40*b*?

4–28 What is the average current through each diode of Fig. 4–41?

Problems

SEC. 5–1 THE ZENER DIODE

5–1 MultiSim An unloaded zener regulator has a source voltage of 24 V, a series resistance of 470 Ω, and a zener voltage of 15 V. What is the zener current?

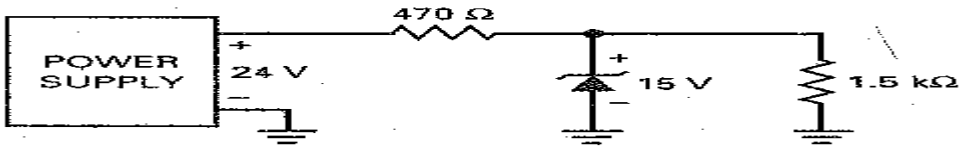
5–2 If the source voltage in Prob. 5–1 varies from 24 to 40 V, what is the maximum zener current?

5–3 If the series resistor of Prob. 5–1 has a tolerance of ±5 percent, what is the maximum zener current?

SEC. 5–2 THE LOADED ZENER REGULATOR

5–4 MultiSim If the zener diode is disconnected in Fig. 5–40, what is the load voltage?

Figure 5–40



5–5 MultiSim Calculate all three currents in Fig. 5–40.

5–6 Assuming a tolerance of ±5 percent in both resistors of Fig. 5–40, what is the maximum zener current?

5–7 Suppose the supply voltage of Fig. 5–40 can vary from 24 to 40 V. What is the maximum zener current?

5–8 The zener diode of Fig. 5–40 is replaced with a 1N9638. What are the load voltage and the zener current?

5–9 Draw the schematic diagram of a zener regulator with a supply voltage of 20 V, a series resistance of 330 Ω, a zener voltage of 12 V, and a load resistance of 1 kΩ. What are the load voltage and the zener current?

SEC. 5–3 SECOND APPROXIMATION OF A ZENER DIODE

5–10 The zener diode of Fig. 5–40 has a zener resistance of 14 Ω. If the power supply has a ripple of 1 V pp, what is the ripple across the load resistor?

5–11 During the day, the ac line voltage changes. This causes the unregulated 24-V output of the power supply to vary from 21.5 to 25 V. If the zener resistance is 14 Ω, what is the voltage change over the foregoing range?

SEC. 5–4 ZENER DROP-OUT POINT

5–12 Assume the supply voltage of Fig. 5–40 decreases from 24 to 0 V. At some point along the way, the zener diode will stop regulating. Find the supply voltage where regulation is lost.

Problems

SEC. 6–3 TRANSISTOR CURRENTS

6–1 A transistor has an emitter current of 10 mA and a collector current of 9.95 mA. What is the base current?

6–2 The collector current is 10 mA, and the base current is 0.1 mA. What is the current gain?

6–3 A transistor has a current gain of 150 and a base current of 30 μA. What is the collector current?

6–4 If the collector current is 100 mA and the current gain is 65, what is the emitter current?

SEC. 6–5 THE BASE CURVE

6–5 MultiSim What is the base current in Fig. 6–20?

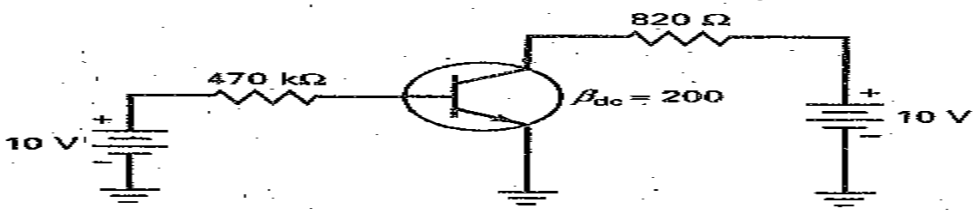


Figure 6–20

6–6 MultiSim If the current gain decreases from 200 to 100 in Fig. 6–20, what is the base current?

6–7 If the 470 kΩ of Fig. 6–20 has a tolerance of ±5 percent, what is the maximum base current?

SEC. 6–6 COLLECTOR CURVES

6–8 MultiSim A transistor circuit similar to Fig. 6–20 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?

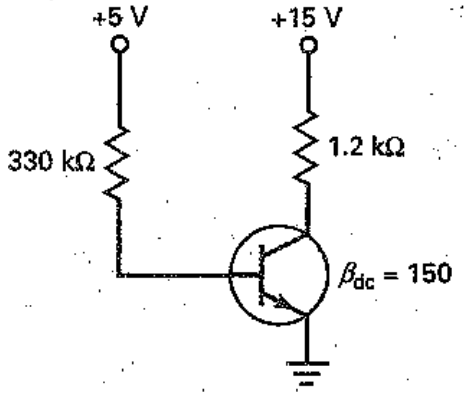
6–9 If a transistor has a collector current of 100 mA and a collector–emitter voltage of 3.5 V, what is its power dissipation?

SEC. 6–7 TRANSISTOR APPROXIMATIONS

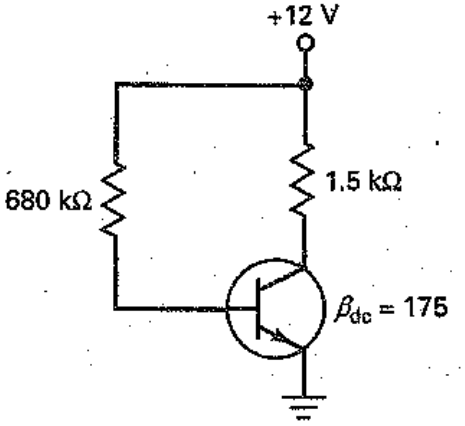
6–10 What are the collector–emitter voltage and the transistor power dissipation in Fig. 6–20? (Give answers for the ideal and the second approximation.)

6–11 Figure 6–21*a* shows a simpler way to draw a transistor circuit. It works the same as the circuits already discussed. What is collector–emitter voltage? The transistor power dissipation? (Give answers for the ideal and the second approximation.)

6–12 When the base and collector supplies are equal, the transistor can be drawn as shown in Fig. 6–21*b*. What is the collector–emitter voltage in this circuit? The transistor power? (Give answers for the ideal and the second approximation.)



(*a*)



(*b*)

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SEC. 4–9 TROUBLESHOOTING

4–29 If the filter capacitor in Fig. 4–41 is open, what is the dc output voltage?

4–30 If only one diode in Fig. 4–41 is open, what is the dc output voltage?

4–31 If somebody builds the circuit of Fig. 4–41 with the electrolytic capacitor reversed, what kind of trouble is likely to happen?

4–32 If the load resistance of Fig. 4–41 opens, what changes will occur in the output voltage?

SEC. 4–10 CLIPPERS AND LIMITERS

4–33 In Fig. 4–42*a*, sketch the output waveform. What is the maximum positive voltage? The maximum negative?

4–34 Repeat the preceding problem for Fig. 4–42*b*.

4–35 The diode clamp of Fig. 4–42*c* protects the sensitive circuit. What are the limiting levels?

4–36 In Fig. 4–42*d*, what is maximum positive output voltage? Maximum negative output voltage? Sketch the output waveform.

4–37 If the sine wave of Fig. 4–42*d* is only 20 mV, the circuit will act as a diode clamp instead of a biased clipper. In this case, what is the protected range of output voltage?

SEC. 4–11 CLAMPERS

4–38 In Fig. 4–43*a*, sketch the output waveform. What is the maximum positive voltage? The maximum negative?

4–39 Repeat the preceding problem for Fig. 4–43*b*.

4–40 Sketch the output waveform of the clamper and final output in Fig. 4–43*c*. What is the dc output voltage with ideal diodes? To a second approximation?

5–13 In Fig. 5–40, the unregulated voltage out of the power supply may vary from 20 to 26 V and the load resistance may vary from 500 Ω to 1.5 kΩ. Will the zener regulator fail under these conditions? If so, what value should the series resistance be?

5–14 The unregulated voltage in Fig. 5–40 may vary from 18 to 25 V, and the load current may vary from 1 to 25 mA. Will the zener regulator stop regulating under these conditions? If so, what is the maximum value for R_S?

5–15 What is the minimum load resistance that may be used in Fig. 5–40 without losing zener regulation?

SEC. 5–5 READING A DATA SHEET

5–16 A zener diode has a voltage of 10 V and a current of 20 mA. What is the power dissipation?

5–17 A 1N968 has 5 mA through it. What is the power?

5–18 What is the power dissipation in the resistors and zener diode of Fig. 5–40?

5–19 The zener diode of Fig. 5–40 is a 1N4744A. What is the minimum zener voltage? The maximum?

5–20 If the lead temperature of a 1N4736A zener diode rises to 100°C, what is the diode's new power rating?

SEC. 5–6 TROUBLESHOOTING

5–21 In Fig. 5–40, what is the load voltage for each of these conditions?

a. Zener diode shorted

b. Zener diode open

c. Series resistor open

d. Load resistor shorted

5–22 If you measure approximately 18.3 V for the load voltage of Fig. 5–40, what do you think the trouble is?

5–23 You measure 24 V across the load of Fig. 5–40. An ohmmeter indicates the zener diode is open. Before replacing the zener diode, what should you check for?

5–24 In Fig. 5–41, the LED does not light. Which of the following are possible troubles?

a. V130LA2 is open.

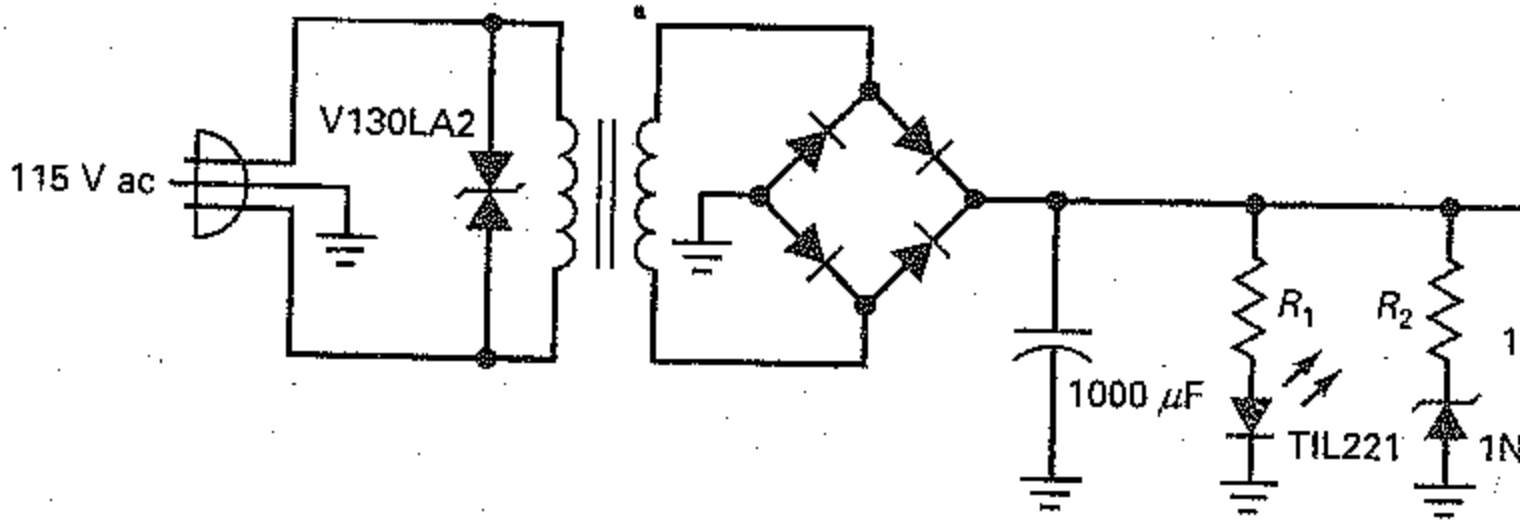
b. Ground between two left bridge diodes is open.

c. Filter capacitor is open.

d. Filter capacitor is shorted.

e. 1N5314 is open.

Figure 5-41



SEC. 5-8 OPTOELECTRONIC DEVICES

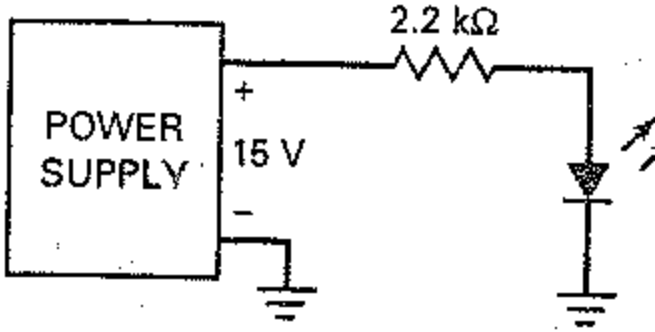
5-25 MultiSim What is the current through the LED of Fig. 5-42?

5-26 If the supply voltage of Fig. 5-42 increases to 40 V, what is the LED current?

5-27 If the resistor is decreased to 1 kΩ, what is the LED current in Fig. 5-42?

5-28 The resistor of Fig. 5-42 is decreased until the LED current equals 13 mA. What is the value of the resistance?

Figure 5-42



SEC. 6–8 READING DATA SHEETS

6–13 What is the storage temperature range of a 2N3904?

6–14 What is the minimum h_{FE} for a 2N3904 for a collector current of 1 mA and a collector–emitter voltage of 1 V?

6–15 A transistor has a power rating of 1 W. If the collector-emitter voltage is 10 V and the collector current is 120 mA, what happens to the transistor?

6–16 A 2N3904 has a power dissipation of 625 mW without a heat sink. If the ambient temperature is 65°C, what happens to the power rating?

SEC. 6–10 TROUBLESHOOTING

6–17 MultiSim In Fig. 6-20, does the collector-emitter voltage increase, decrease, or remain the same for each of these troubles?

a. 470 kΩ is shorted

b. 470 kΩ is open

c. 820 Ω is shorted

d. 820 Ω is open

e. No base supply voltage

f. No collector supply

Up–Down Analysis

Use Fig. 6–22 for the remaining problems. Assume increases of approximately 10 percent in the independent variable, and use the second approximation of the transistor. A response should be an N (no change) if the change in a dependent variable is so small that you would have difficulty measuring it.

6–25 Predict the response of each dependent variable in the row labeled V_{BB}. Then answer the following question as simply and directly as possible. What effect does an increase in the base supply voltage have on the dependent variables of the circuit?

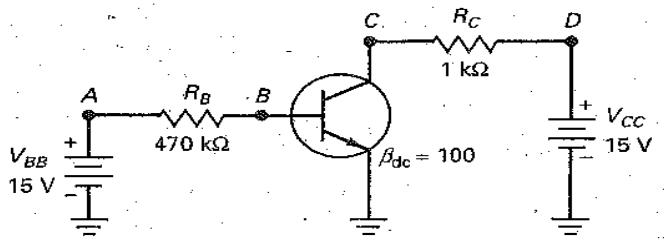
6–26 Predict the response of each dependent variable in the row labeled V_{CC}. Then summarize your findings in one or two sentences.

6–27 Predict the response of each dependent variable in the row labeled R_B. List the dependent variables that decrease. Explain why these variables decrease, using Ohm's law or similar basic ideas.

6–28 Predict the response of each dependent variable in the row labeled R_C. List the dependent variables that show no change. Explain why these variables show no change.

6–29 Predict the response of each dependent variable in the row labeled β_{dc}. List the dependent variables that decrease. Explain why these variables decrease.

Figure 6–22 Up-down analysis.



UP-DOWN ANALYSIS

INDEPENDENT VARIABLES	DEPENDENT VARIABLES								
	V_A	V_B	V_C	V_D	I_B	I_C	P_B	P_C	P_D
V_{BB}									
V_{CC}									
R_B									
R_C									
β_{dc}									

1. Jawaban dalam file docx dengan menggunakan equation formula
2. Softcopy simulasi dengan multisim

Cara kirim:
a. File (1,2) di winrar dengan nama file : Nama_Nim_DE2019_HW2_ Dioda_Transistor
b. Kirim ke verdysgn@gmail.com