Sheet (1) - Electronics
Prof. Dr/ Essam Elshafee

1)A sample of germanium is doped to the extent of 10^{14} donor atoms/cm^3 and $2x10^{14}$ acceptor atoms/cm^3. At the temperature of the sample the conductivity of pure (intrinsic) germanium is 0.02 $(\Omega\text{-cm})^{-1}$. If the total conduction current density is 0.128A/cm^2, find the applied electric field intensity. (μ_p=1800cm^2/V.s and μ_n=1800cm^2/V.s at 300°K).

2) What PIV rating is required for the diodes in a Full-Wave Center-Tapped Rectifier that produces an average output voltage of 60 V?

3) Determine the ripple factor for the filtered rectifier with a load as indicated in Figure -1. What minimum PIV rating must the diodes have? (Vγ = 0.7V)

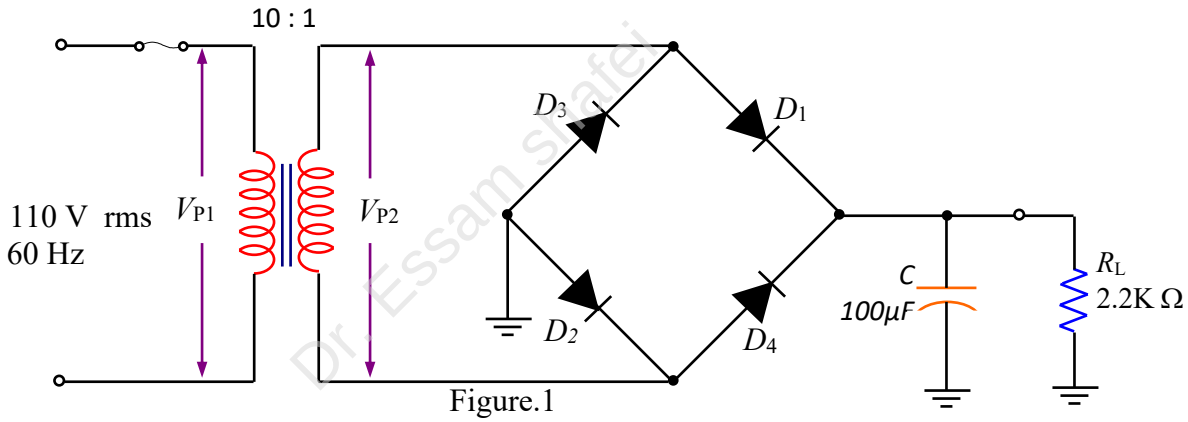


Figure.1

4) Determine the ripple factor for the filtered rectifier with a load as indicated in Figure -2. What minimum PIV rating must the diodes have? (Vγ = 0.7V)

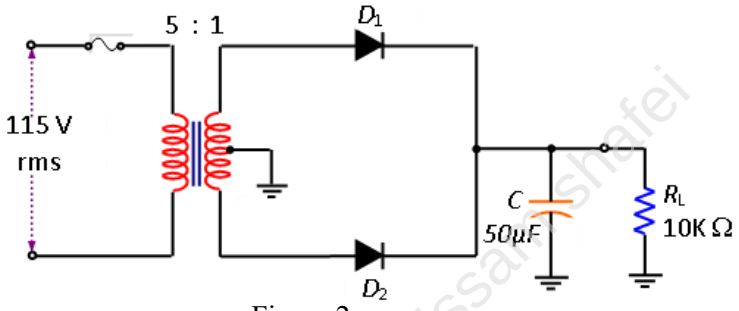
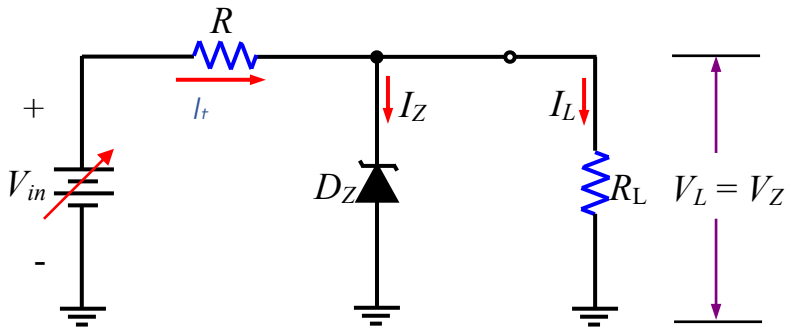


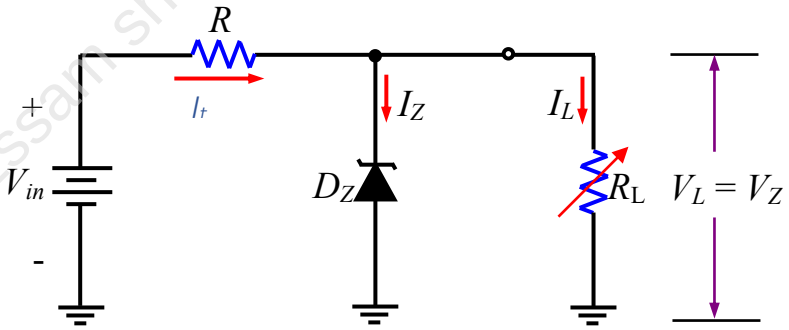
Figure 2

5) What value of filter capacitor is required to produce a 1% ripple factor for a full-wave rectifier having a load resistance of 1.5KΩ? Assume the rectifier produces a peak output of 18V from a 60 Hz ac source.

6) For the voltage regulator shown in Figure, assume that V_Z=40V, R=40Ω, r_Z=0, and R_L=400Ω. Voltage V_i varies between 48 and 60V.
(i) Specify the maximum and minimum current for the Zener diode.
(ii) Determine the maximum power dissipated in resistance R and in the zener diode ($P_{R(max)}$ and $P_{Z(max)}$).



7) For the voltage regulator shown in figure.2, assume that V_Z=30V, V_{in}=150V, R= 600Ω, r_Z=0, and I_{ZK} = 10 mA, I_{ZM} = 190 mA. Determine:
(i) the variation in R_L over which the load voltage is still regulated at the Zener voltage.



(ii) the maximum power dissipated in resistance R_L and in the Zener diode ($P_{L(max)}$ and $P_{Z(max)}$)

8) For the circuit shown in Figure-2 I_{o1}=2μA, I_{o2}=1μA, I_{o3}=3μA, V_{Z1} =20V, V_{Z2} =30V, V_{Z3} =50V, r_{Z1}=10Ω, r_{Z2}=30Ω, r_{Z3}=20Ω, $V_{\gamma 1}$=$V_{\gamma 2}$=0.6V, $V_{\gamma 3}$= 0.5V, and R=10kΩ. Calculate the current passing through the circuit if V_{in} = -10V, V_{in} = +10V, V_{in} = -60V and V_{in} = 60V.

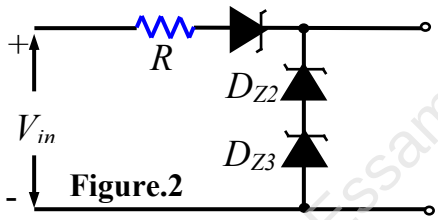


Figure.2

Sheet (2) – Electronics (1)
Prof. Dr/ Essam Elshafi

1) The diodes shown in Figure.1 are ideal. Sketch the transfer characteristics for $0 \le V_i \le 100V$. Indicate the state of each diode (on or off) over each region of the characteristic.

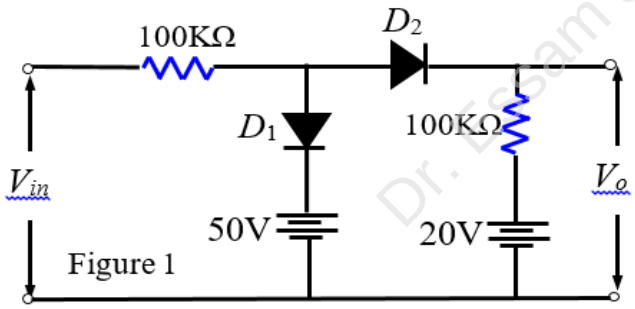


Figure 1

2) The diodes shown in Figure.2 are ideal. Sketch the transfer characteristics for $-20 \le V_i \le 20V$. Indicate the state of each diode (on or off) over each region of the characteristic.

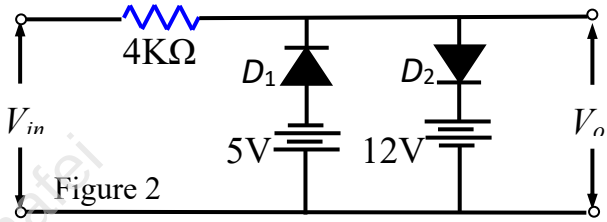


Figure 2

3) Determine whether or not the transistor shown in Figure 3 in saturation. Assume VCE(sat.) = 0.2 V and β =150.

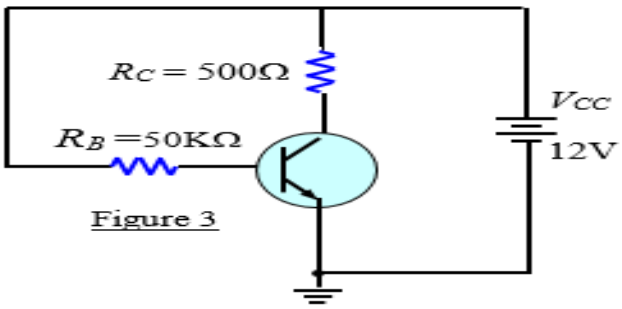


Figure 3

4) The diodes shown in Figure.4 are ideal. Sketch the transfer characteristics for $-20 \le V_i \le +20V$. Indicate the state of each diode (on or off) over each region of the characteristic.

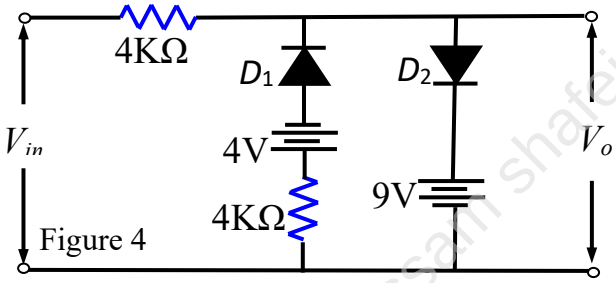


Figure 4

5) If = 45, IE =2mA and VBE =0.7V, find R in the circuit shown in figure.5

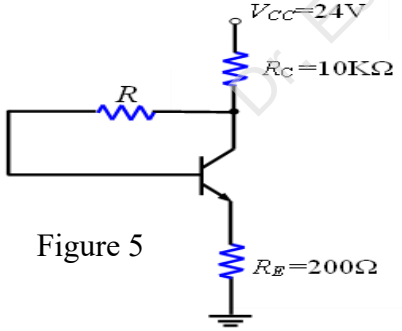


Figure 5

6) If β = 45 and VBE = 0.7V, find R in the amplifier circuit shown in Figure.6 for a zener current IZ =2mA.

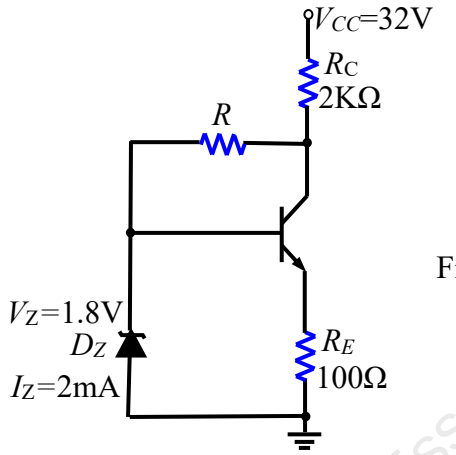


Figure 6

7) If = 49 and VBE =0.7V, find R in the circuit shown in figure.7 for an collector current IC =1.96mA.

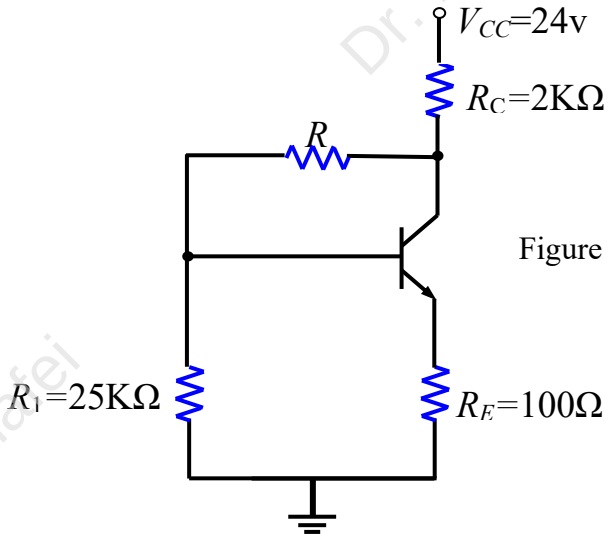


Figure 7

8) For each transistor in the circuit shown in Figure.8, the parameters are β = 100, and V_{BE} = 0.7V. Determine the quiescent base, collector, and emitter currents in Q_1 and Q_2, Also determine V_{CEQ1} and V_{CEQ2}

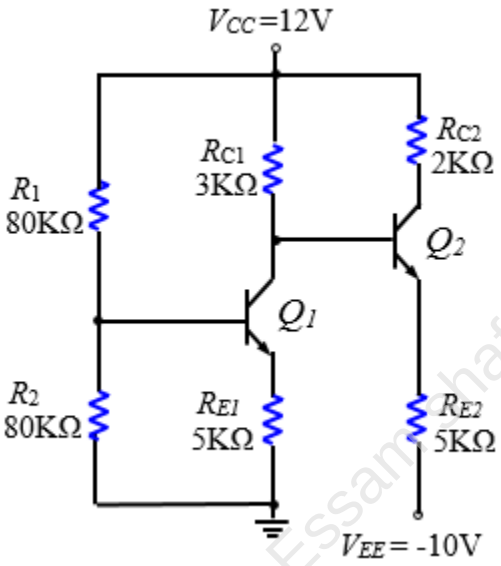


Figure 8