03 Dec 2022

EE101 Tutorial 3

Q1. Determine V_o for network of Figure 1 for the input shown.

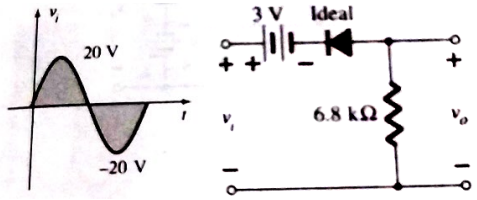

Figure.1

Q2. Determine ***Vo*** for network of Figure.2 for the input shown.

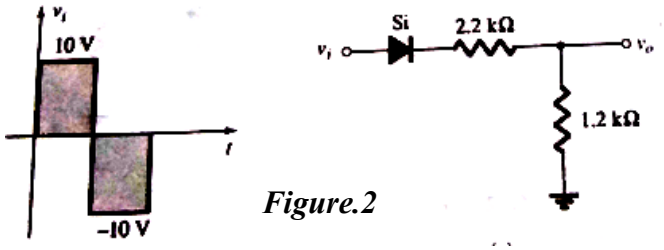

Figure.2

Q3. Sketch ***Vo*** for network of Figure.3 for the input shown.

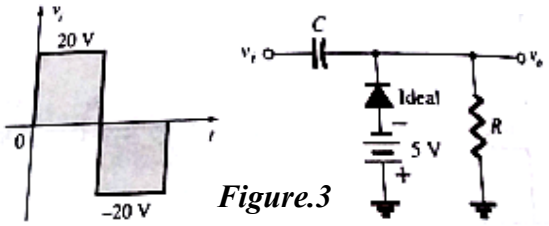

Figure.3

Q4. Sketch ***Vo*** for network of Figure.4 for the input shown. Would it be a good approximation to consider the Diode to be ideal for configuration? Why?

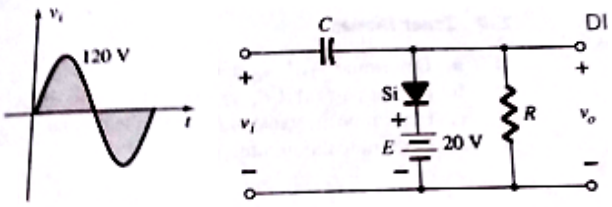

Figure.4

Q5. In the circuit shown in the Figure.5, $I_{S1} = I_{S2} = 3 \times 10^{-16}$ *A*.

a) Calculate V_B such that $I_X = 1$ *mA.*

b) With the value of V_B found in (a), choose I_{S3} such that $I_Y = 2.5$*mA*.

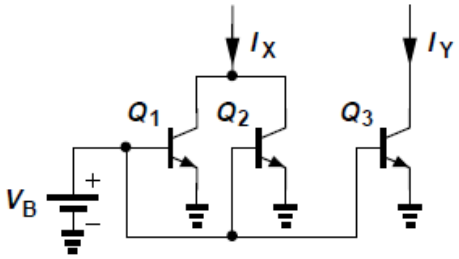

Figure.5

Q6. In the circuit shown in the Figure.6.

a) If $I_{S1} = 2I_{S2} = 5 \times 10^{-16}$ *A*, Determine V_B such that $I_X = 1.2$ *mA*.

b) What value of R_C places the transistors at the edge of the active mode?

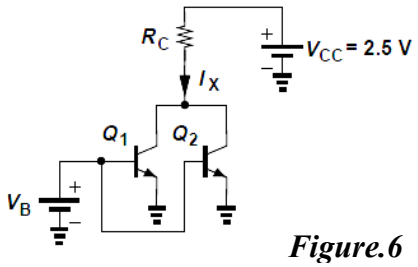

Figure.6

Q7. Calculate V_X in Figure.7 ***if*** $I_S = 6 \times 10^{-16}$ ***A***.

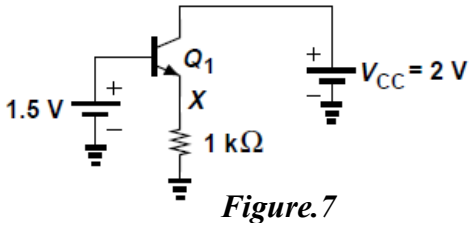

Figure.7

Q8. Consider the circuit shown in Figure.8 , assuming $\beta = 100$ and $I_S = 7 \times 10^{-16}$ ***A***. If ***R1 = 10 kΩ***, Determine V_B such that $I_C = 1$ ***mA***.

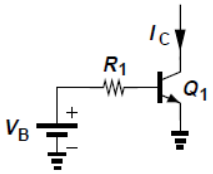

Figure.8

Q9. In the circuit of Figure.9, $I_{S1} = 3 \times 10^{-16}$ ***A***, $I_{S2} = 5 \times 10^{-16}$ ***A***, $\beta_1 = \beta_2 = 100$, ***R1 = 5 kΩ,*** and $V_B = 800$ ***mV***. Calculate I_X and I_Y.

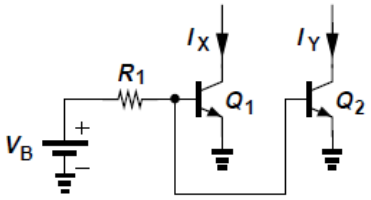

Figure.9

Q10. Most applications require that the transconductance of a transistor remain relatively constant as the signal level varies. Of course, since the signal changes the collector current, ***gm*** = I_C/V_T does vary. Nonetheless, proper design ensures negligible variation, e.g., ***±10%***. If a bipolar device is biased at $I_C = 1$ ***mA***, what is the largest change in V_{BE} that guarantees only ***±10%*** variation in g_m?

Q11. Assume $I_S = 2 \times 10^{-17}$ ***A***, $VA = \infty$, and $\beta = 100$ in Figure.10. What is the maximum value of R_C if the collector-base must experience a forward bias of less than ***200 mV***?

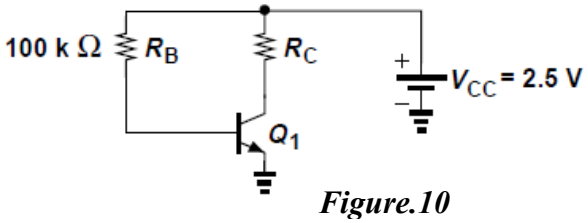

Figure.10