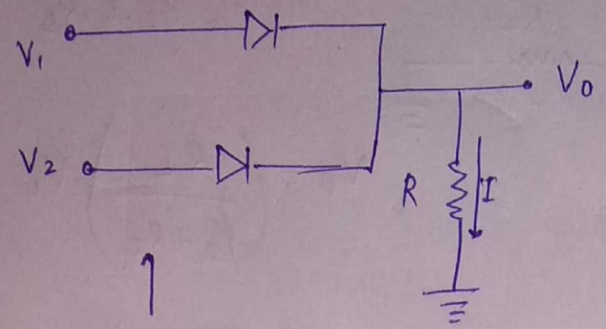
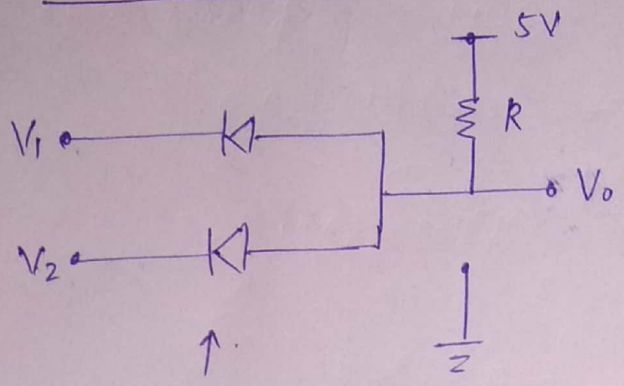
Digital Logic using diode: - Diode can puform certain logic functions.



V_1	V_2	V_0
0	0	0
5	0	4.3
0	5	4.3
5	5	4.3

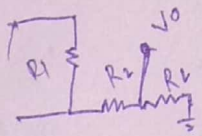
OR logic ckt.

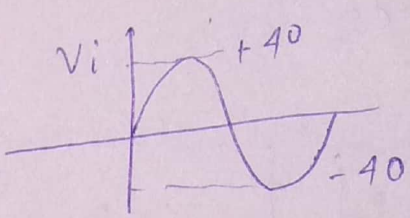


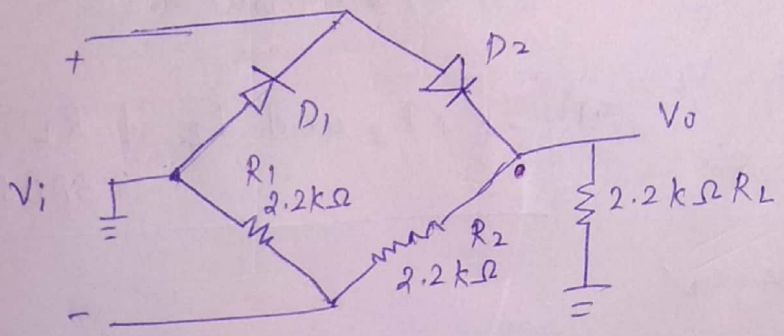
V_1	V_2	V_0
0	0	0.7
5	0	0.7
0	5	0.7
5	5	5

AND logic ckt

Ques Rectifier ckt







Across R_2 it is V_i

Across R_1 and R_L combined is V_i

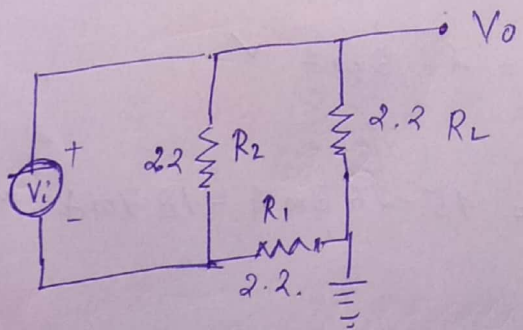
$\frac{2.2}{2.2}$

Across R_L → voltage divider ckt

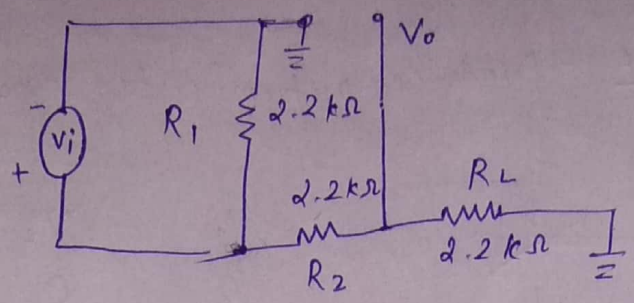
$$\left(\frac{R_L}{R_L + R_1}\right) V_i = \frac{1}{2} \times 40V$$

$$= 20V.$$

for +ve ½ cycle.



for -ve ½ cycle.

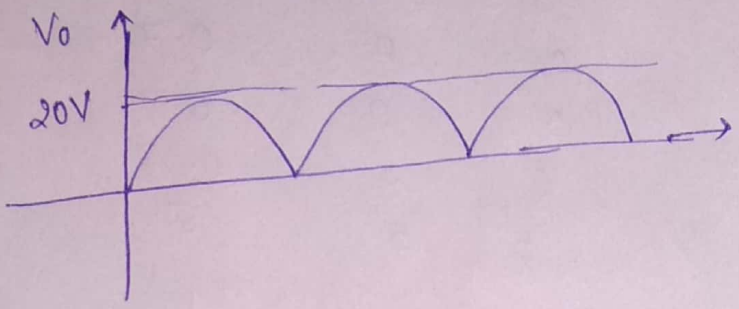


Vi across R_1 and combinedly across R_2 & R_L

$$V_o = \left(\frac{R_L}{R_2 + R_L}\right) V_i$$

$$V_o = \left(\frac{2.2}{2.2+2.2}\right) \times 40V$$

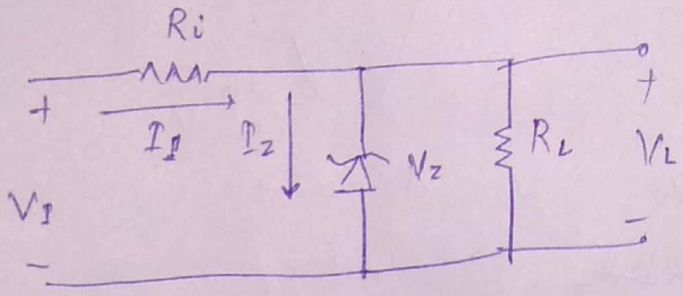
$$V_o = 20V$$



Ques Zener diode

$V_I = 20V$ $V_Z = 10V$ $R_i = 222\Omega$

$P_Z(max) = 400mW$



a) I_L, I_Z and I_I if $R_L = 380\Omega$

$$I_I = \frac{20-10}{222} = 45mA \checkmark$$

$$I_L = \frac{10}{380} = 26.3mA \checkmark$$

$$I_Z = I_I - I_L = 45 - 26.3mA = 18.7mA \checkmark$$

b) Value of R_L that will establish P_z (max) in diode.

$$P_z(max) = 400mW \quad I_z(max) = \frac{400mW}{10} = 40mA$$

$$I_L(min) = I_T - I_z(max) = 45 - 40 = 5mA$$

$$R_L = \frac{10}{I_L(min)} = 2k\Omega.$$

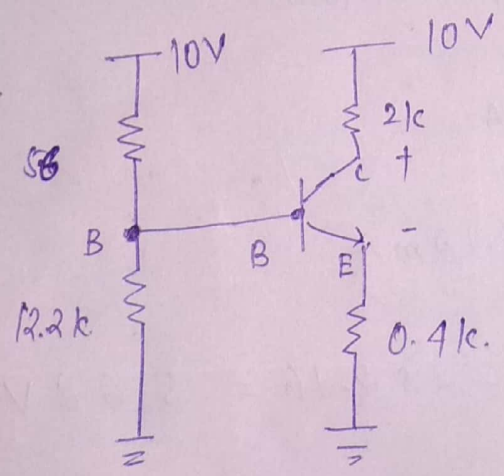
c) Repeating both questions for $R_i = 175\Omega$.

$$I_T = 57.1mA \quad I_L = 26.3mA \quad I_z = 30.8mA$$

$$I_z(max) = 40mA \Rightarrow I_L(min) = 57.1 - 40 = 17.1mA$$

$$R_L = \frac{10000}{17.1} \Rightarrow 585\Omega.$$

Ques.



$V_{BE} = 0.7V \quad \beta = 100$

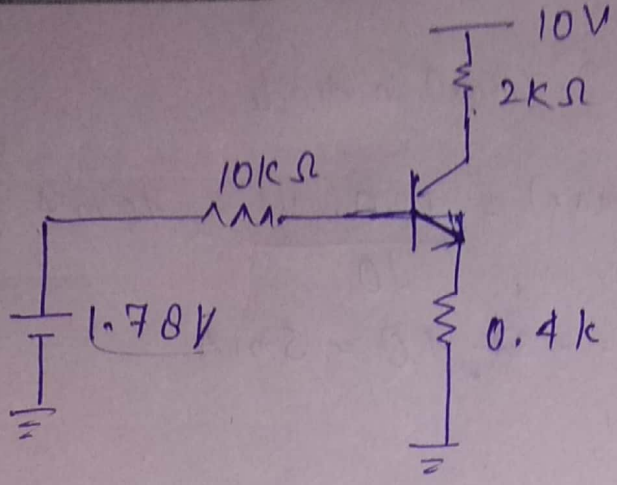
Calculate V_{CEQ}, i_{CQ}, i_E, i_B

10V is divided

As it is a voltage divider circuit we find V_{th} which is across $12.2k\Omega$ and effective resistance.

$$V_{th} = \left(\frac{12.2}{12.2+56}\right) \times 10 = \frac{12.2}{68.2} \times 10 = 1.78V$$

$$R_{th} = \frac{56 \times 12.2}{68.2} = 10k\Omega$$



$$-1.78 + 10 I_B + 0.7 + 0.4 I_C = 0$$

$$\beta I_B = I_C$$

$$I_C = 100 I_B$$

$$-1.78 + 10 I_B + 0.7 + 40 I_B = 0$$

$$50 I_B = 1.78 - 0.7 = 1.08$$

$$I_B = 0.0216 \text{ mA} = 21.6 \mu A$$

$$I_C = 2.16 \text{ mA}$$

$$I_E = I_B + I_C = 21.6 \mu A + 2.16 \text{ mA}$$

$$= 0.0216 + 2.16 \text{ mA}$$

$$= 2.1816 \text{ mA} \Rightarrow 2.18 \text{ mA}$$

$$V_C = 10 - 2 \times I_C = 10 - 2 \times 2.16 = 5.68 \text{ V}$$

$$V_E = 0.4 \times I_E = 0.4 \times 2.18 = 0.87 \text{ V}$$

$$V_{CE} = V_C - V_E = 4.81 \text{ V}$$