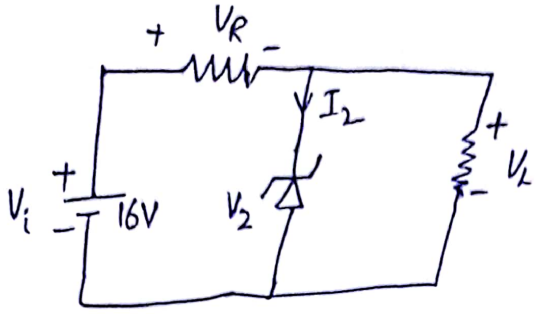
* for zenar diode shown in the fig determine



$R_L = 1.2k\Omega$

$V_Z = 10V$

(i) V_R (ii) I_Z and (iii) P_Z

and

Repeat with $R_L = 3k\Omega$

P_Z = Power generated across zenar diode

$= V_Z \times I_Z$

$$V_L = \frac{R_L}{R+R_L} \times V_i = \frac{1.2k\Omega}{1k\Omega + 1.2k\Omega} \times 16 = 8.73\,V$$

AS $V_L < V_Z$, zenar diode is in off state,

so, diode can be replaced by open circuit.

$$V_R = V_i - V_L$$

$$= 16 - 8.73\,V$$

$$P_Z = V_Z \times I_Z = (8.73) \times 0 = 0$$

(b) For $R_L = 3k\Omega$

$$V = \frac{R_L}{R+R_L} \times 16 = \frac{3k\Omega}{1k\Omega + 3k\Omega} \times 16V = 12V$$

$V_L = V_Z = 10\,V$

$I_L = \frac{V_Z}{R_L} = \frac{10}{1k} = 3.33\,mA$

$V_R = V_i - V_Z$

$= 16 - 10 = 6V$

$i_R = \frac{V_R}{R} = \frac{6}{1K} = 6\,mA$

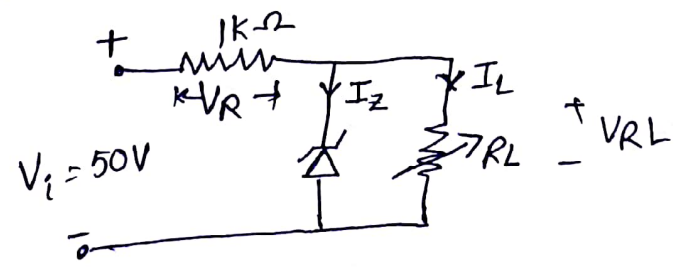
$i_Z = i - i_L$

$= (6 - 3.33)\,mA$

$= 2.67\,mA$

$P_Z = V_Z i_Z = 26.7\,mW.$

2. Determine the Range of R_L and I_L that will result in V_{RL} being maintained at 10V



$V_Z = 10V$

$I_{Z\,max} = 32\,mA$

$I_{Z\,min} = 0\,mA$

Find max Wattage Rating of Diode

Case (i) $I_Z = 0\,mA$

$V_{RL} = 10\,V$

$V_R = V_i - V_{RL} = 50 - 10 = 40V$

$I_R = \frac{V_R}{R} = \frac{40V}{1K\Omega} = 40mA$

$I_R = I_L = 40mA$

$R_L = \frac{V_{RL}}{I_L} = \frac{10\,V}{40mA} = 0.25K\Omega$

case (ii)

$I_{Z\,max} = 32\,mA$

$V_Z = 10\,V$

$V_R = V_i - V_Z = (50-10)\,V = 40\,V$

$I_R = \frac{40\,V}{1\,k\Omega} = 40\,mA$

$I_R = I_Z + I_L$

$I_L = I_R - I_Z$

$I_{L\,min} = (40-32) = 8\,mA$

$R_{L\,max} = \frac{10\,V}{8\,mA} = \frac{5}{4}\,k\Omega$

$= 1.25\,k\Omega$

I_L Range $(8\,mA, 40\,mA)$

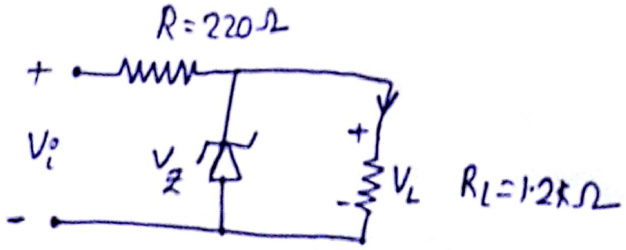
R_L Range $(0.25\,k\Omega, 1.25\,k\Omega)$

$P_{Z\,max} = V_Z \cdot I_{Z\,max}$

$= 10 \times 32\,mA$

$= 320\,mW$

3.



Determine the range of value of V_I that will main the zenar diode in on state

$V_Z = 20V$ $I_{Z\,max} = 60mA$ $I_{Z\,min} = 0\,mA$

Case (i)

zener is just on

$I_z = 0$ mA

$V_L = 20$ V

$I_L = \frac{V_L}{R_L} = \frac{20\text{ V}}{1.2\text{ k}\Omega} = \frac{100}{6}$ mA

$V_R = I_R \times R = I_L \times R = 220 \times \frac{100}{6}$ mAΩ

$= \frac{22}{6}$ V

$V_i = \frac{22}{6} + 20 = \frac{71}{3}$ V

Case (ii)

zener with I_z as max

$I_Z = 60$mA

$I_R = I_Z + I_L$

$= (60 + \frac{100}{6})$mA

I_L will be same as in case (i)

$V_R = (60 + \frac{100}{6}) \times 220\text{m}\Omega \times \Omega$

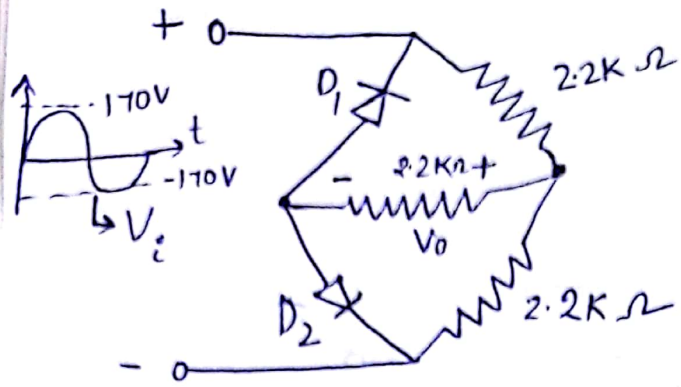
$= \frac{4.6 \times 11}{3}$ V

$= \frac{4.6 \times 11}{3}$ V

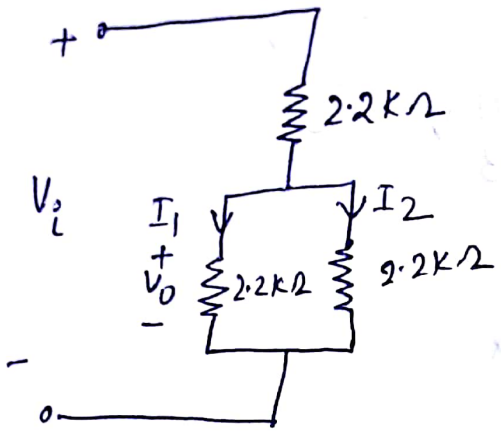
$= 18.83$

$V_i'\text{max} = 18.8 + 20 = 38.8$V

4.) Sketch V_o and determine V_o for the Given Circuit. where the diodes are ideal.



(i) For +ve cycle:



$$I = \frac{V_i}{Reff}$$

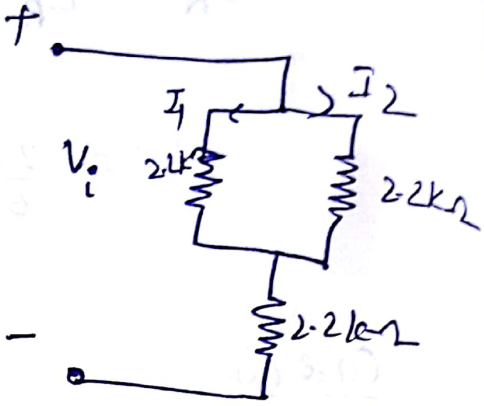
$$Reff = 2.2K + (2.2K \,||\, 2.2K)$$

$$= 3.3K\Omega$$

$$I = \frac{V_i}{3.3K} = \frac{170}{3.3}$$

$$I_1 = \left(V_i / 3.3k\right)/_2 = \frac{170}{6.6} A$$

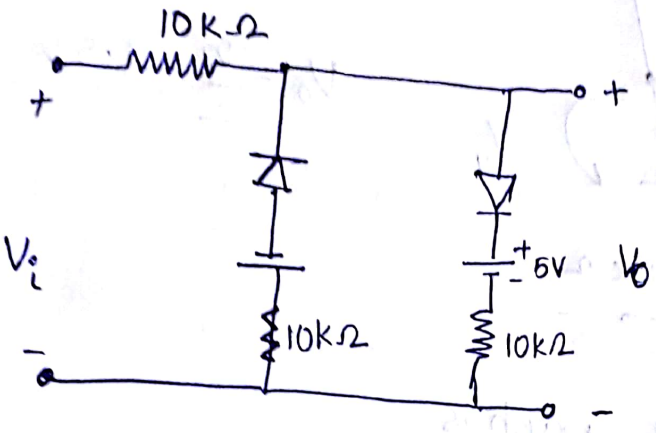
(ii) For -ve cycle



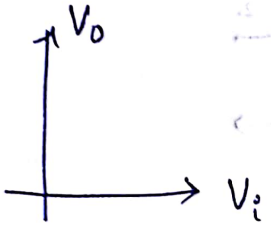
$$I = \frac{V_i}{Reff}$$

$$= \frac{170}{6.6} A.$$

(6) Assuming diodes to be ideal calculate transverse characteristic



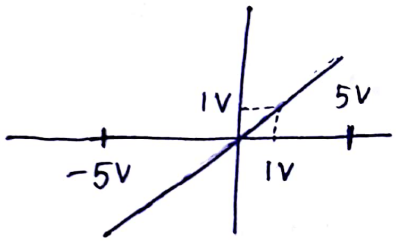
We should find the relation between V_i & V_0 and plot



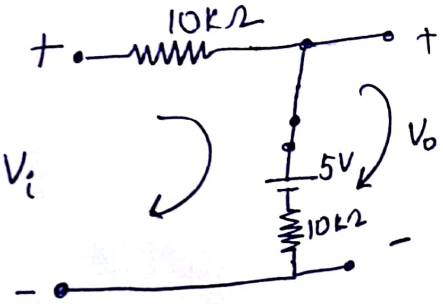
consider

(a) $-5 \le V_i \le +5V$ (b) $V_i > 5$ (c) $V_i < -5$

(a)



(b) $V_i > 5$

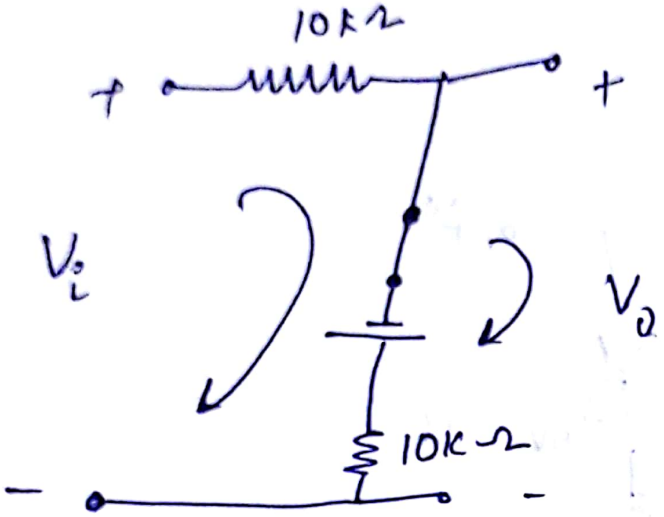


$$i = \frac{V_i - 5}{20k.}$$

$$V_0 = 5 + 10i$$

$$V_0 = \frac{V_i}{2} + 2.5V$$

(c) $V_i < -5V$



$$V_0 = \frac{V_i}{2} - 2.5V$$

So, final graph is