Assignment - 2

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Section: 01

Course: CSE251

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Ans. to the Ques No. 1

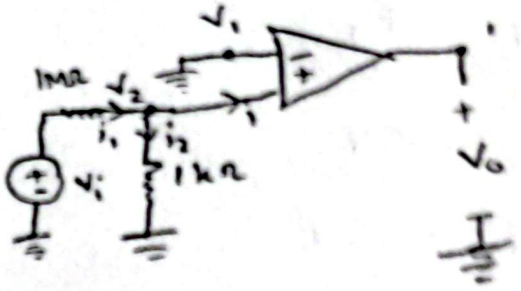
2

KCL at V_2,

$i_1 = i + i_2 : [\because i = 0]$

$\therefore i = i_2$

$\therefore V_i$, 2MΩ, 1kΩ — all in series.



Voltage - Pividan,

$$V_2 = \frac{1k\Omega}{1k\Omega + 1M\Omega} \times V_i = \frac{10^3 \times \cdot}{10^3 + 10^6} \times 2V$$

$$= 1.998 \times 10^{-3} V$$

$$= 1.998 \, mV$$

$V_o = A(V_2 - V_1)$

$\Rightarrow 4 = A(1.998 \times mV - 0)$

$\Rightarrow A = \frac{4}{1.998 \times 10^{-3}}$

$= 2002.$

(Ans)

4

$V_2 = 0$

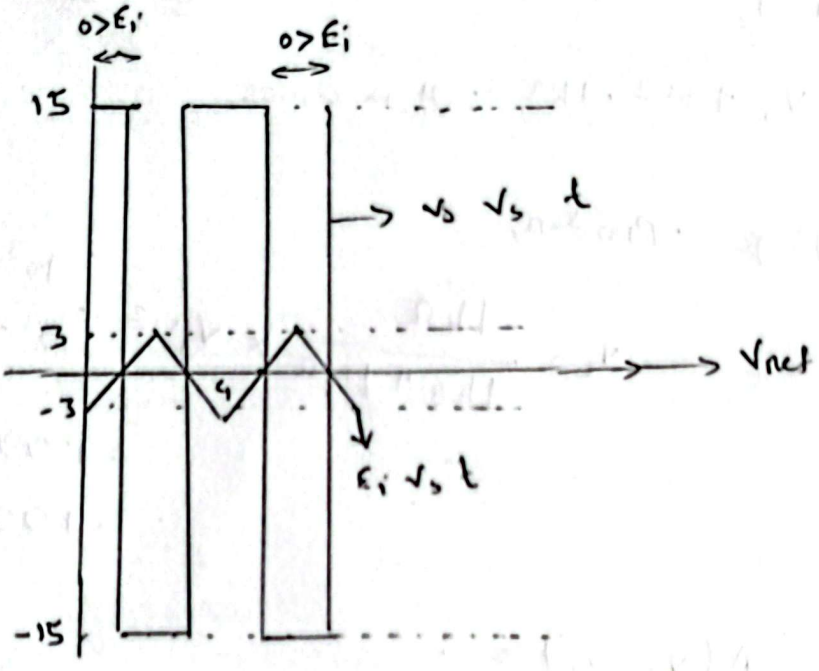
$V_1 = E_i$

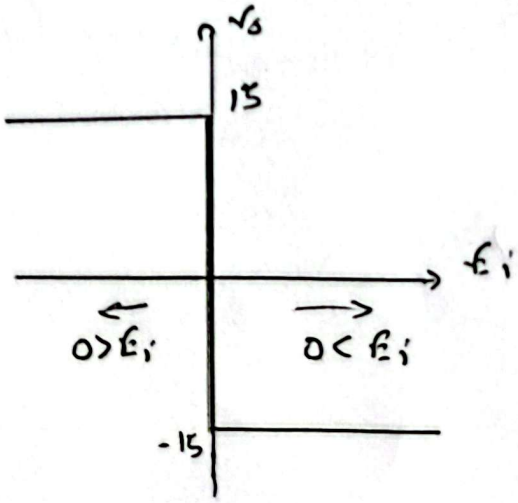
$V_s^+ = 15V$

$V_s^- = -15V$

$\therefore V_2 > V_1 \Rightarrow V_o = +V_s^+$

$\therefore V_2 < V_1 \Rightarrow V_o = -V_s^-$



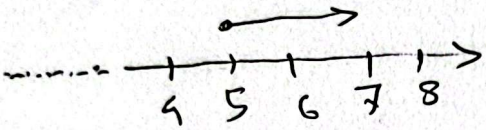


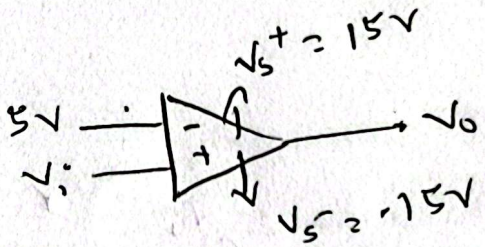
5

i) $V_i > 5V$

$V_0 = 15V \quad [V_s^+ = 15V]$

$\left[\begin{array}{l} V_2 > V_1, V_0 = V_s^+ \\ V_2 < V_1, V_0 = V_s^- \end{array} \right]$





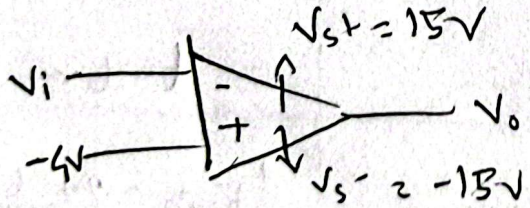
ii) $V_i < -4$

$V_0 = 15V$] - case-i

$V_i > -4$

$V_0 = -15$] - case-ii

$\therefore$



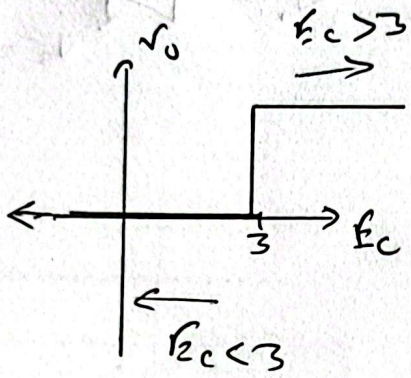
7

$V_2 = V_C$

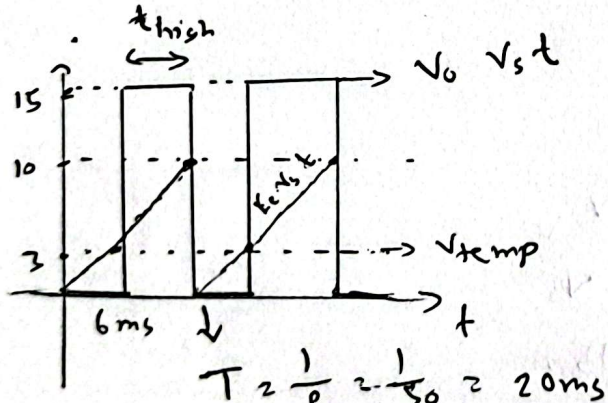
$V_1 = V_{temp} = 3V$

[$V_C > 3, V_o = V_s^+ = 15V$
$V_C < 3, V_o = V_s^- = 0V$]

a)



b)



$T = \frac{1}{f} = \frac{1}{50} = 20ms$

c) (0,0)
(20ms, 10V)

$\therefore V - 0 = \frac{10-0}{20-0}(t-0)$

$\Rightarrow V = \frac{1}{2}t$

$V = 3,$

$3 = \frac{1}{2}t$

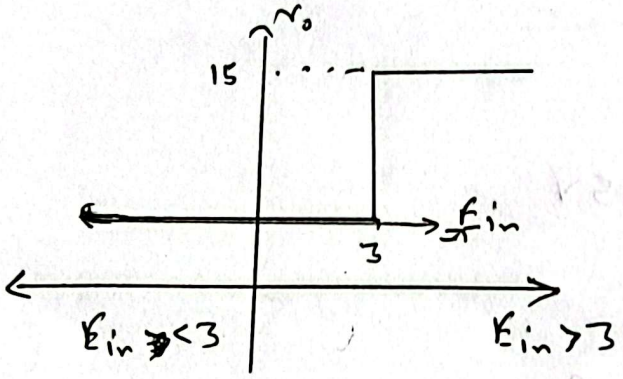
$\therefore t = 6ms$

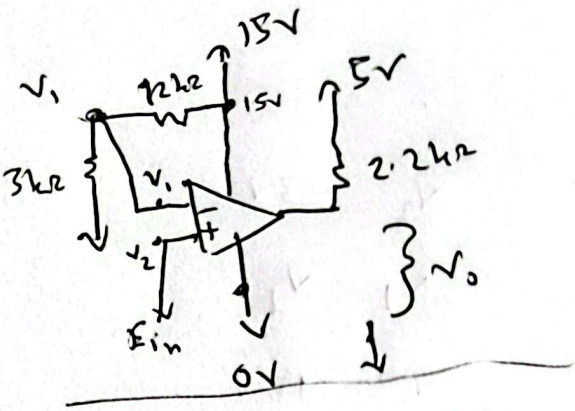
$t_{high} = 20 - 6$
$= 14ms$

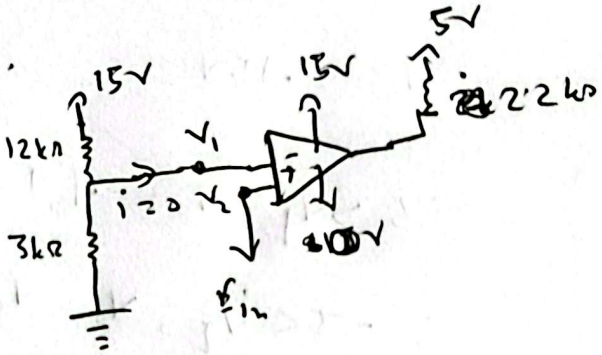
10

a) $E_{in} > 3$, $V_o = V_s^+ = 15$

$E_{in} < 3$, $V_o = V_s^- = 0V$

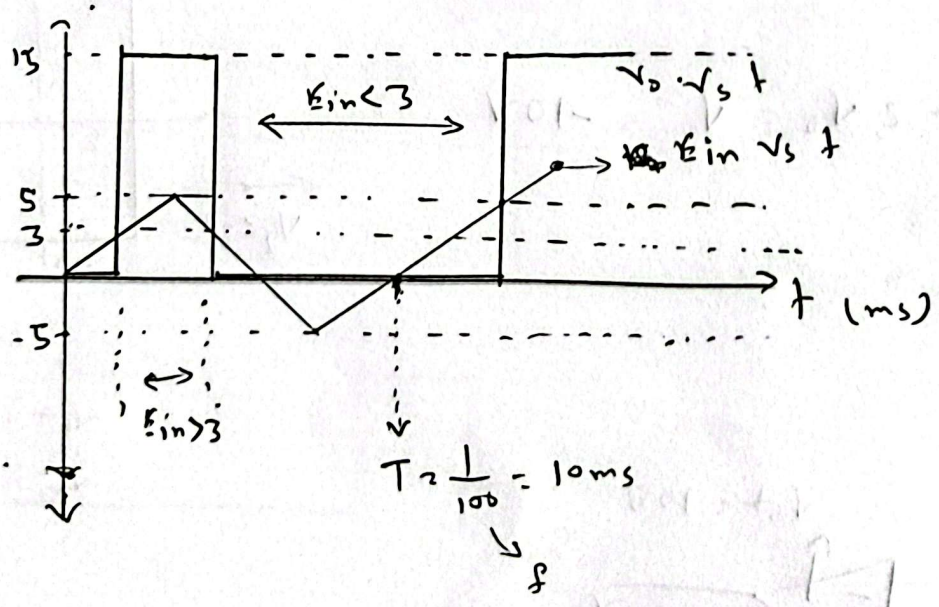






$$V_1 = \frac{3}{12+3} \times 5 = 3V$$

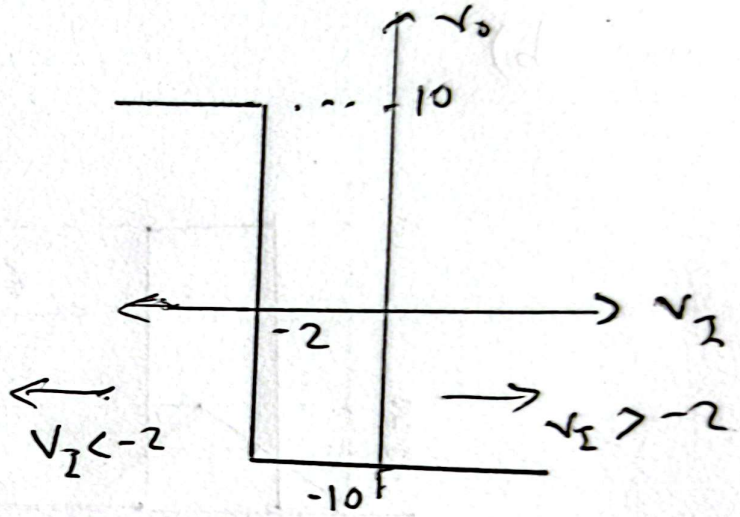
b)



$f = 100$ Hz

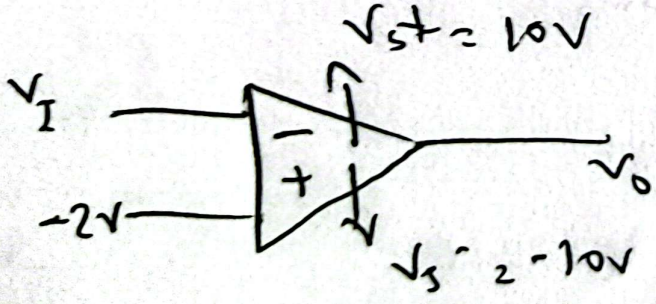
$V_I < -2,\ V_o = V_s^+ = 10V$

$V_I > -2, V_o = V_s^- = -10V$



$V_s^+ = 10$

$V_s^- = -10$



if $V_i > 3V$, $V_A = 8V$

if $V_i < 3V$, $V_A = 0V$

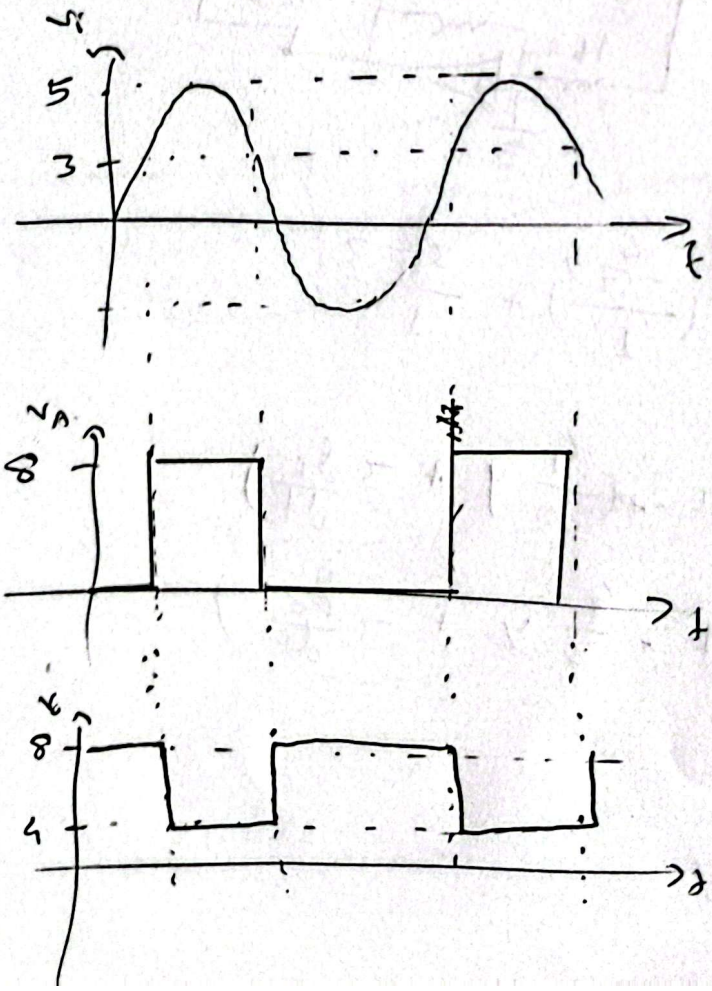
2nd Diode,

$3 - V_+ = -3$ ~~$\therefore V_+ = 6V$~~

$\therefore V_+ = 6V$

if $V_- > 6V$, $V_o = 4V$

if $V_- < 6V$, $V_o = 8V$

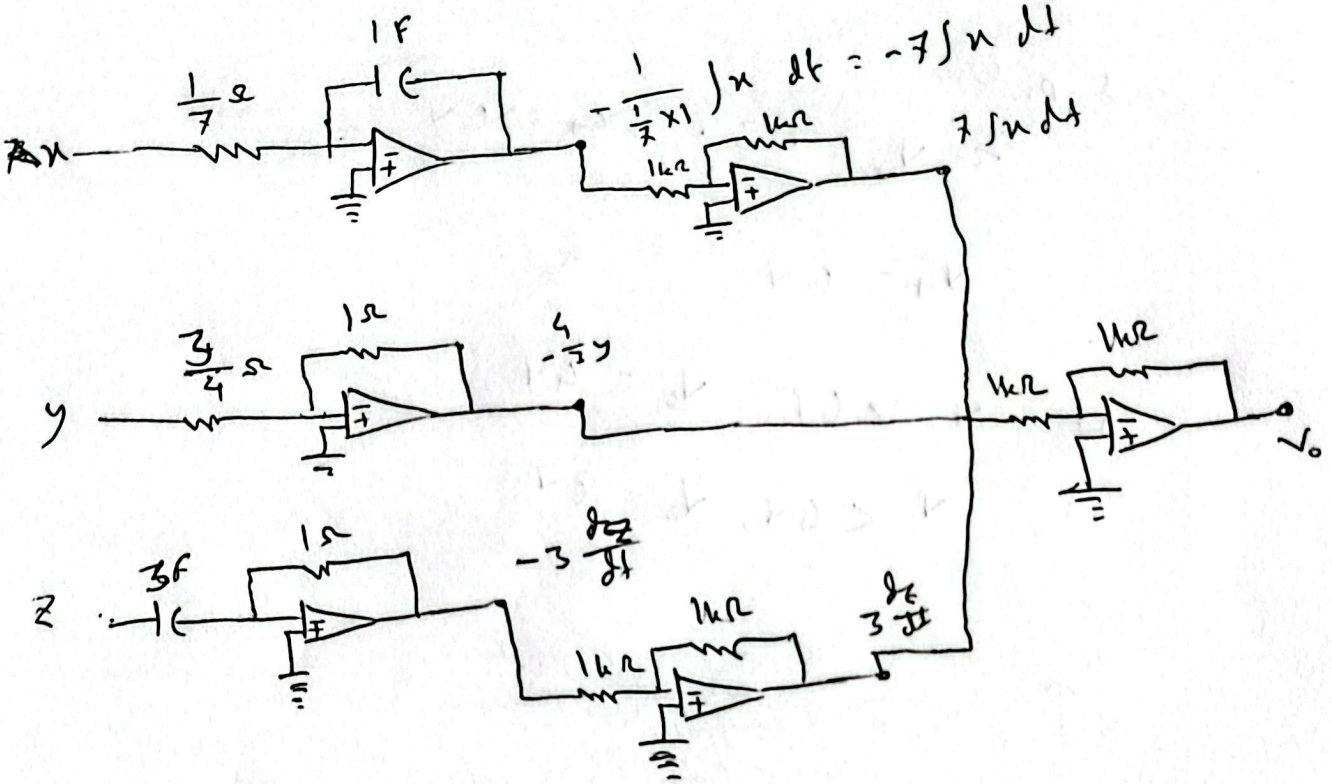


Ans. to Ques. No. - 2

1

iv

$$f = -7\int x\,dt + \frac{4}{3}y - 3\frac{d}{dt}z = -\left\{7\int x\,dt + \left(-\frac{4}{3}y\right) + 3\frac{dz}{dt}\right\}$$



$$V_o = -R_o\left\{\frac{7\int x\,dt}{1} + \left(\frac{-\frac{4}{3}y}{1}\right) + \frac{3\frac{dz}{dt}}{1}\right\}$$

$$= -1\left(7\int x\,dt - \frac{4}{3}y + 3\frac{dz}{dt}\right)$$

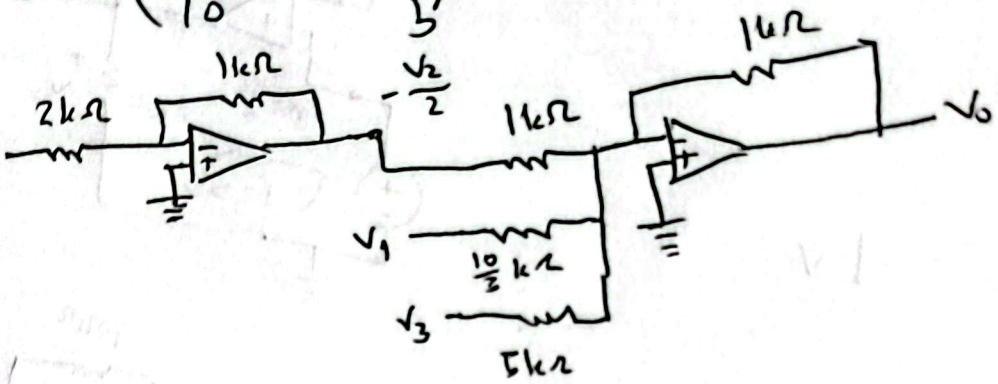
$$= -\left(7\int x\,dt - \frac{4}{3}y + 3\frac{dz}{dt}\right)$$

2

i

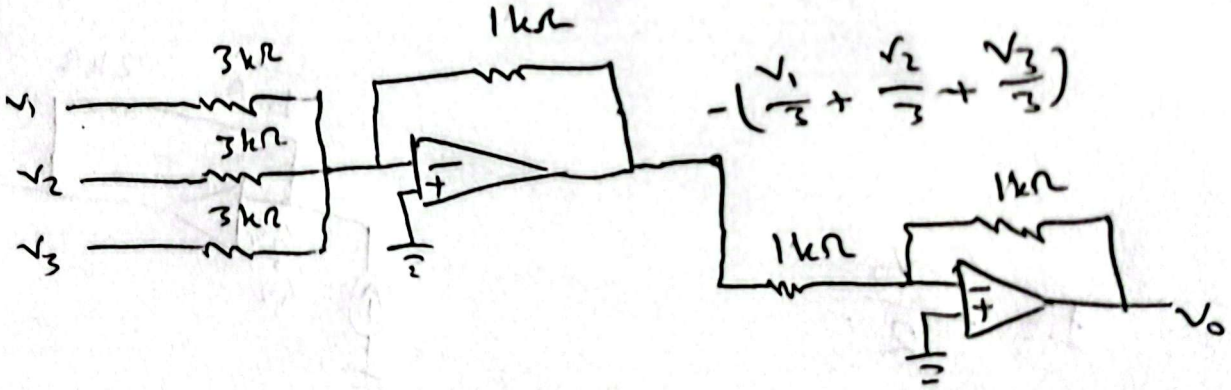
$$-V_o = \frac{V_3}{5} - \frac{V_1}{5} + \frac{V_1}{2} - \frac{V_2}{2}$$

$$\Rightarrow V_o = -\left(\frac{3V_1}{10} + \frac{V_3}{5} - \frac{V_2}{2}\right)$$



ii

$$\text{Average} = \frac{V_1 + V_2 + V_3}{3}$$

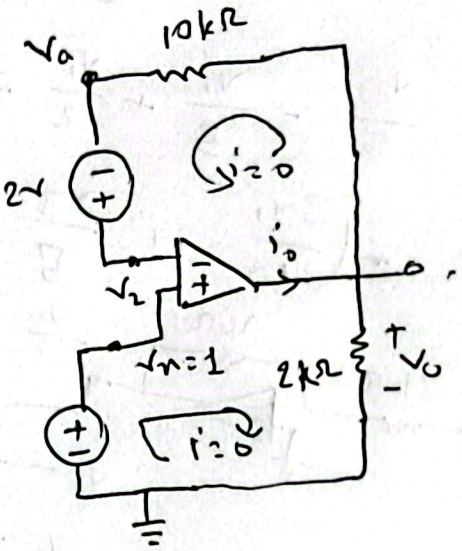


$$V_o = \frac{V_1}{3} + \frac{V_2}{3} + \frac{V_3}{3}$$

$$= \frac{V_1 + V_2 + V_3}{3}$$

4

a



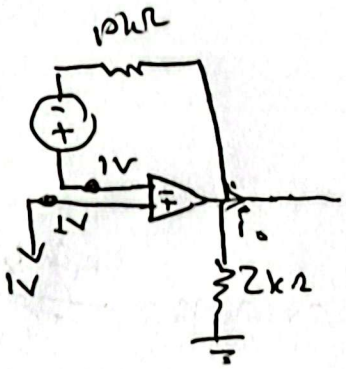
$1 - v_a = 2$

$\therefore v_a = -1V$

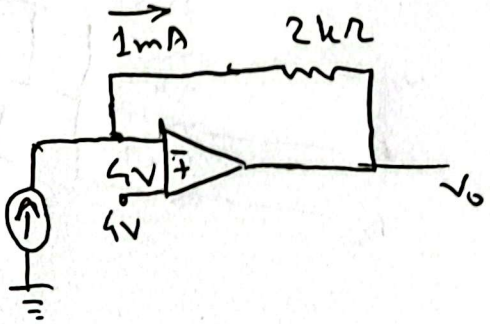
$v_o = v_a = -1V$

$i_o = \frac{v_o - 0}{2} = -\frac{1}{2}\ mA$

$= -0.5mA$



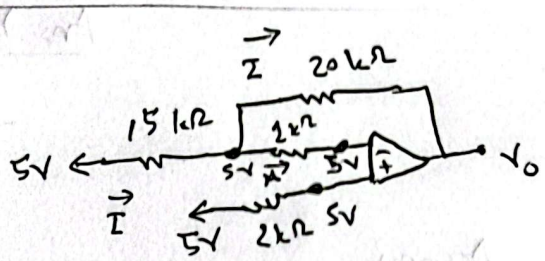
b



$1 = \frac{4 - v_o}{2}$

$\therefore v_o = 2V$

10



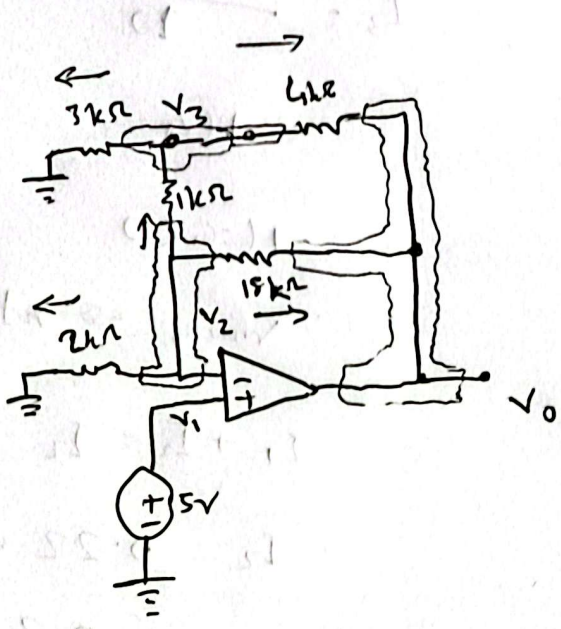
$$I = \frac{5-5}{15} = 0$$

$$I = \frac{5-V_o}{20}$$

$$\therefore \frac{5-V_o}{20} = 0$$

$$\therefore V_o = 5V$$

14



$$\frac{V_2}{2} + \frac{V_2-V_o}{18} + \frac{V_2-V_3}{1} = 0$$

$$\Rightarrow \frac{9V_2 + V_2 - V_o + 18V_2 - 18V_3}{18} = 0$$

$$\Rightarrow -V_o + 28V_2 - 18V_3 = 0$$

$$\therefore -V_o + 28V_2 - 18V_3 = -140 \ldots (i)$$

$$\frac{V_3 - V_o}{4} + \frac{V_3 - V_2}{1} + \frac{V_3}{3} = 0$$

$$\Rightarrow \frac{3V_3 - 3V_o + 12V_3 - 12V_2 + 4V_3}{12} = 0$$

$$\Rightarrow -3V_o - 12V_2 + 19V_3 = 0$$

$$\therefore -3V_o - 19V_3 = 60 \ldots (ii)$$

$$\therefore I_o = \frac{V_3}{4} + \frac{V_2}{18} = 1.92\,mA$$

$V_1 = 5V$

$V_2 = 5V$

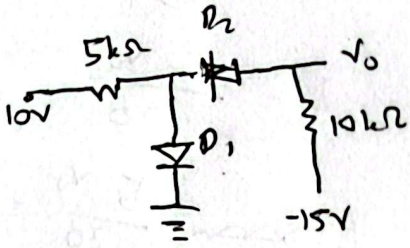
Ans. to the ques No. 3

Part - i

8

Assuming, - i

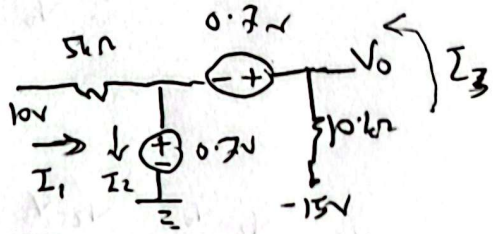
Both D_1, D_2 on



$$I_1 = \frac{10 - 0.7}{5} = 1.86 \text{ mA}$$

$$I_3 = \frac{-15 - 0.7 - 0.7}{10}$$

$$= -1.64$$



$\because -16.4 < 0$

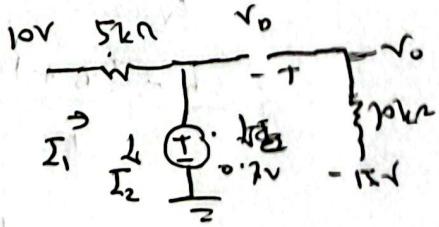
$\therefore$ Wrong assumption for D_2

$$I_1 + I_3 = I_2$$

$$\therefore I_2 = 0.22 \text{ mA}$$

$\because 0.22 > 0$

$\therefore$ Right assumption for D_1



Assuming, - ii

D_1 = On

D_2 = off

$I_1 = 1.86 \text{ mA}$

$I_1 = I_2 = 1.86$

$\because 1.8I > 0.$

$\therefore$ Right assumption for D_1

$V_d = -15 - 0.7 = -15.7$

$\because -15.7 < 0.7$

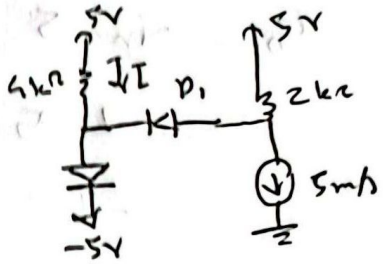
$\therefore$ Right assumption for D_2

$\therefore V_0 = -15V.$

$\therefore$ Assumption - ii correct.

9

Assuming, D_1 = off, D_2 = on



$\frac{V_n - 5}{2} = -5$

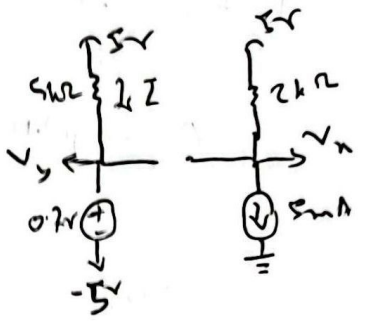
$\therefore V_n = -5V$

KVL

$5 + 5 = 4I + 0.7$

$\therefore I = 2.325 > 0$

$\therefore D_2$ is on



$\frac{V_y - 5}{4} = -2.325$

$\therefore V_y = -4.35$

$V_y = -5 + 4.35$

$= -0.65$

$\therefore -0.65 < 0$

$\therefore D_1$ is off

$\therefore$ Assumption correct

15

Assuming,

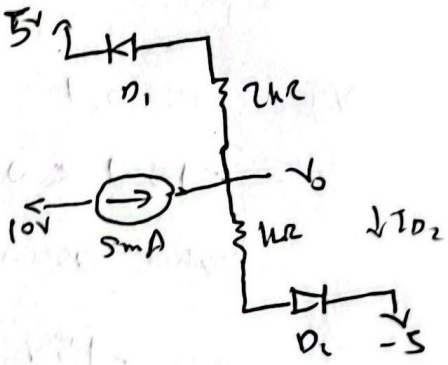
D_1 = off

D_2 = on

$V_0 = 0.7V$

$$\frac{V_n - 0.7}{2} = 0$$

$\therefore V_n = 0.7$



$V_{D_1} = V_n - 5$

$= 0.7 - 5$

$= -4.3 < 0$

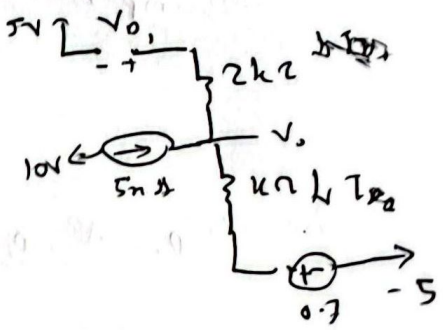
$\therefore I = 5mA > 0$

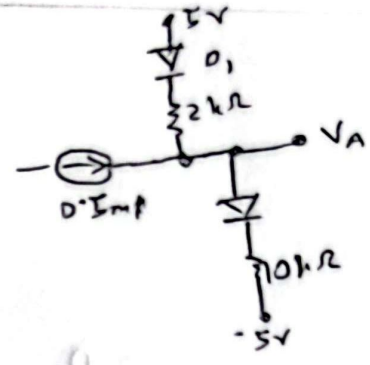
$\therefore$ Assumption correct.

V_0,

$$5 = \frac{V_0 - 0.7 + 5}{1}$$

$\therefore V_0 = 0.7V$





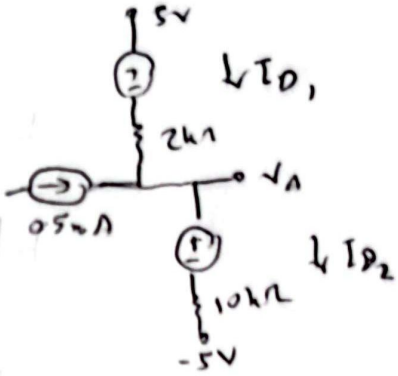
Assuming,

Both D_1, D_2 On

KCL,

$$I_{D_2} + 0.5 = I_{D_2}$$

$$\therefore I_{D_1} - I_{D_2} = -0.5 \quad \ldots (i)$$



$$5 + 5 = 0.7 + 2I_{D_1} + 0.7 + 10I_{D_2}$$

$$\Rightarrow 10 - 2\times 0.7 = 2I_{D_1} - 10I_{D_2}$$

$$\therefore 2I_{D_1} + 10I_{D_2} = 8.6 \quad \ldots (ii)$$

$$I_{D_1} = 0.3 > 0$$

$$I_{D_2} = 0.8 > 0$$

KCL on V_A,

$$I_{D_1} + 0.5 = I_{D_2}$$

$$\Rightarrow \frac{5 - V_A - 0.7}{2} + 0.5 = 0.8$$

$$\therefore V_A = 3.7\,V$$

$\therefore$ D_1 and D_2 both on.

$\therefore$ Assumption correct.

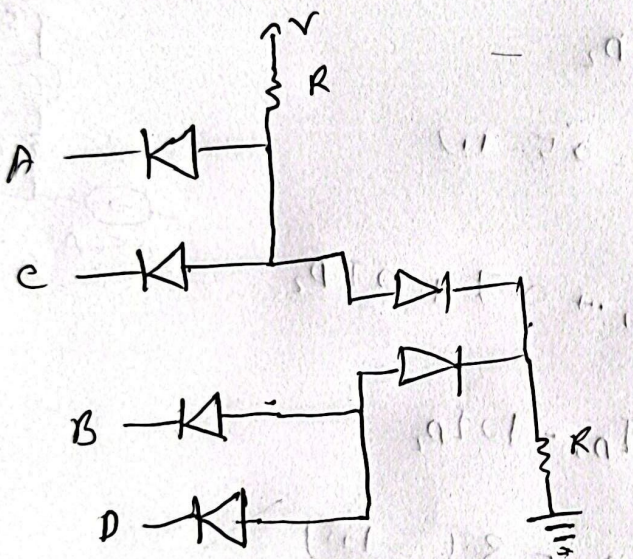
Ans. to the Ques. No. - 3

Part-ii

1

ii

$A \cdot C + B \cdot D$



3

x	y	z	f
4V	3V	4V	4V
5V	3V	4V	4V
13V	3V	4V	4V