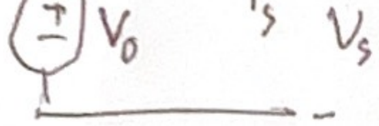
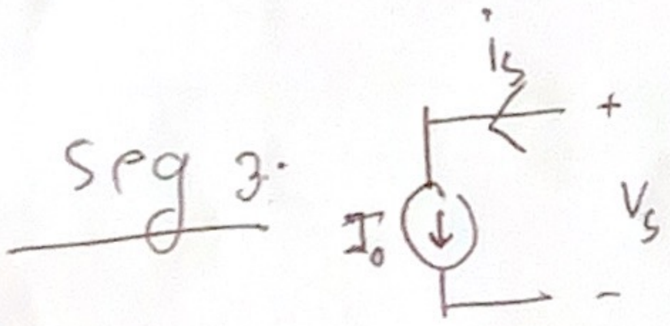
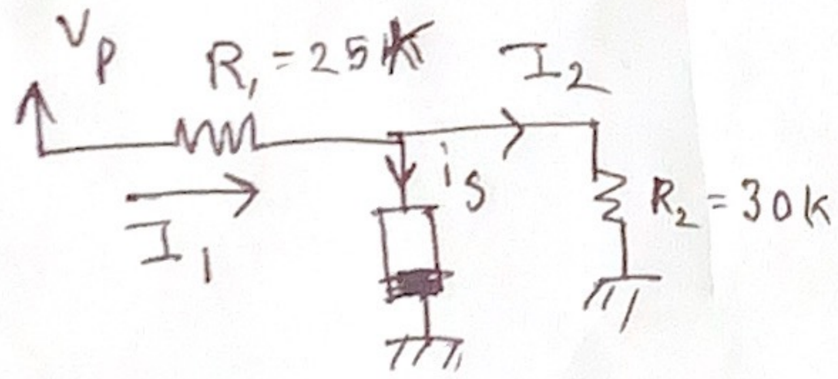
	model	Param	cond
① (a) Seg 1:	 D.C.	no param	$V_s \leq 2V$
Seg 2:		V_0 = x-intercept = 2V	$V_s < 2 \leq 5V$
Seg 3:		$I_0 = 1.25(5-2)$ $= 3.75mA$	$V_s > 5V$

$$R = \frac{1}{\text{slope}} = 0.8k\Omega$$

$$y = 1.25(x-2)$$

$$i_s = 1.25(v_s - 2)$$

(b)



(c) From graph, when $v_s = 3V \Rightarrow$ segment 2.

Hense, $i_s = 1.25(v_s - 2) = 1.25mA$

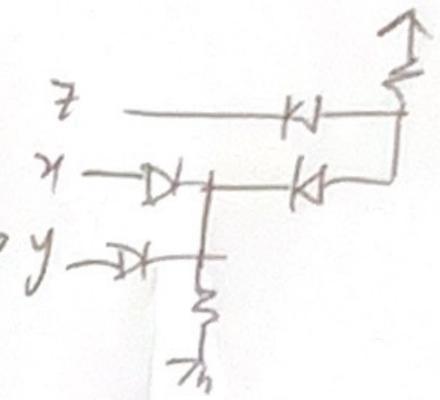
(d) KCL $\Rightarrow I_1 = i_s + I_2$ = 1.25 + 0.1 = 1.35mA

Ohm's law $\rightarrow I_2 = \frac{v_s}{R_2} = \frac{3V}{30k} = 0.1mA$

KVL $\Rightarrow V_p = I_1 R_1 + V_s = 1.35 \times 25k + 3 = 36.75V$

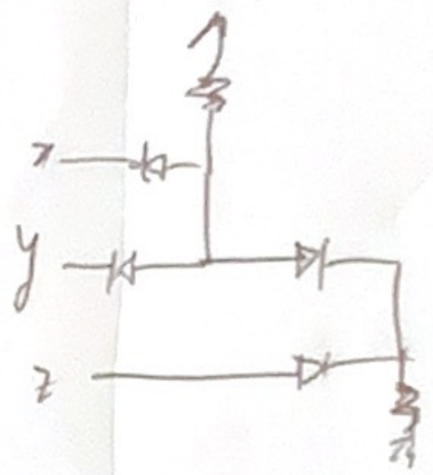
Q2

(a) Either $f = (x+y)z$



OPT-1

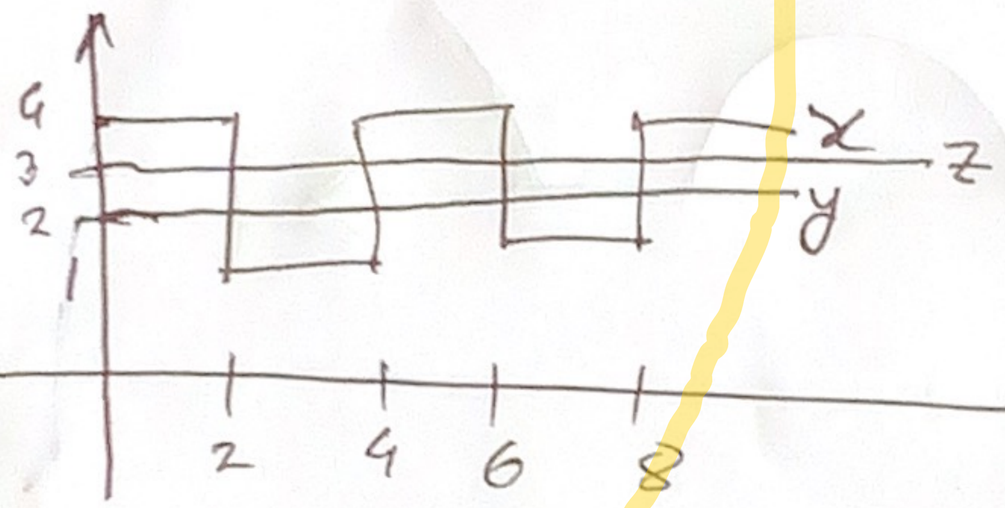
or $f = x.y + z$



OPT-2

(b) for OPT-1:

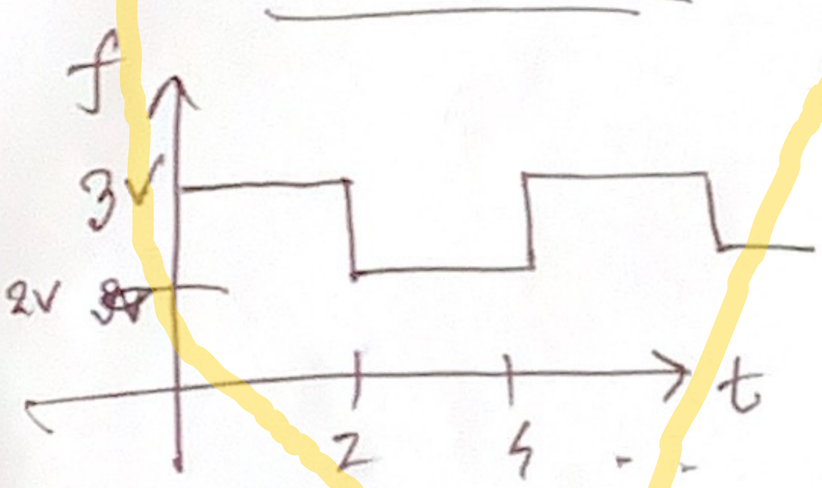
$f = \min(\max(x, y), z)$



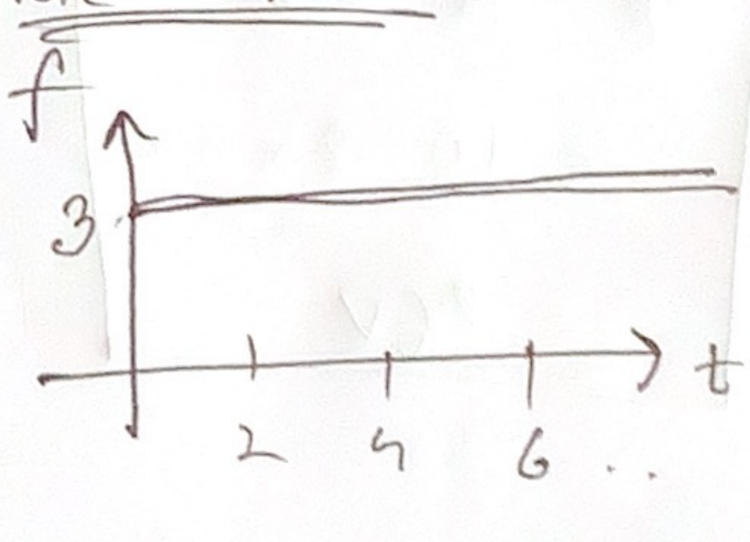
for OPT-2:

$f = \max(\min(x, y), z)$

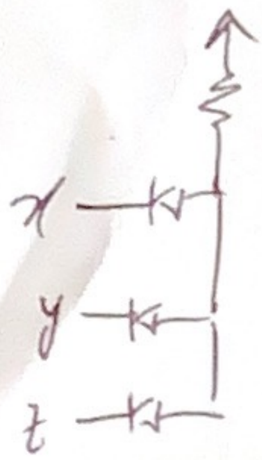
for OPT-1



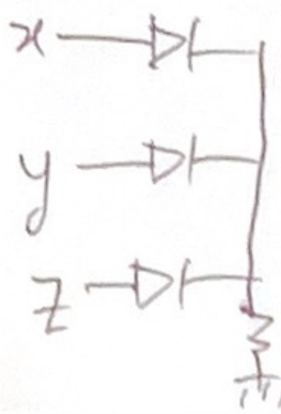
for OPT-2



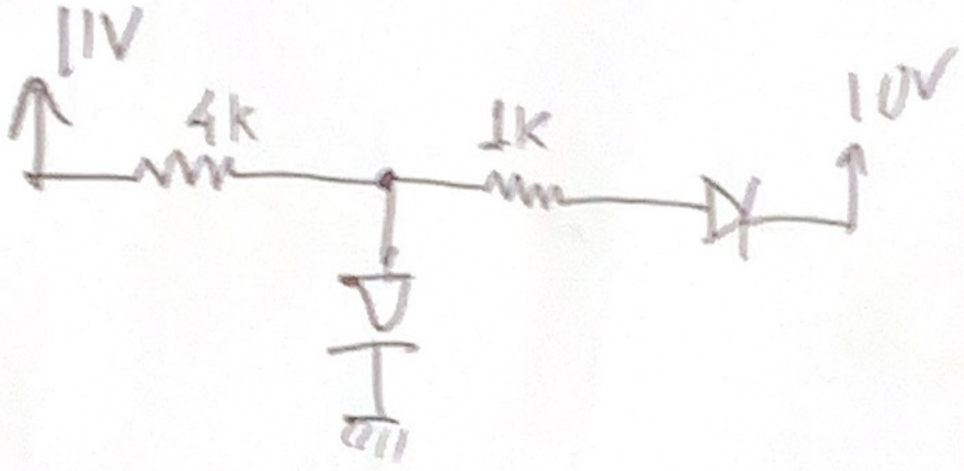
(c) $f = x.y.z$



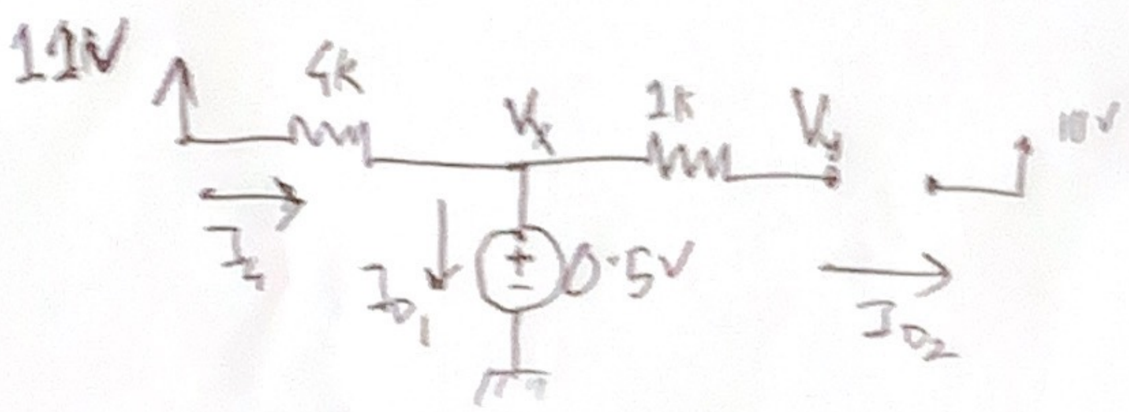
$f = x + y + z$



Q3



(a) $D_1 = ON, \quad D_2 = OFF$



$V_x = V_y = 0.5V$

$$I_4 = I_{D_1} = \frac{11 - 0.5}{4} = 2.625\,mA$$

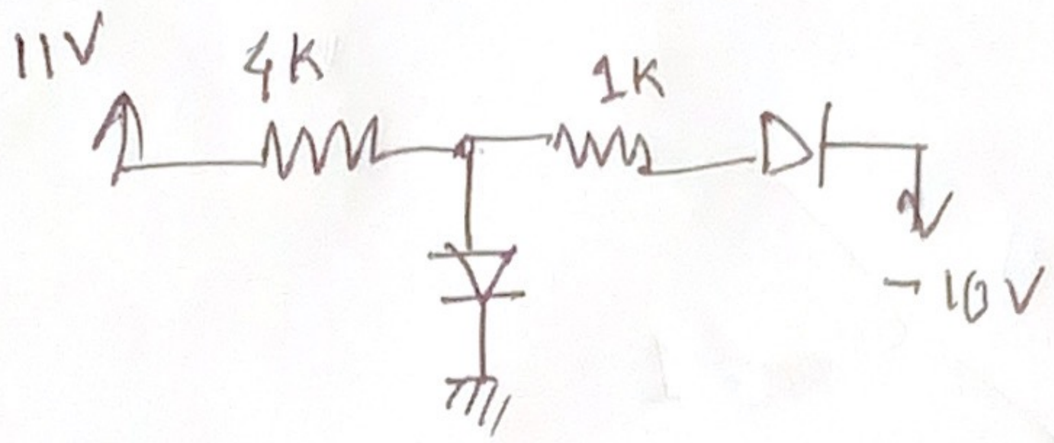
$$I_{D_2} = 0$$

(b) $D_1(ON) \Rightarrow I_{D_1} > 0 \Rightarrow TRUE$

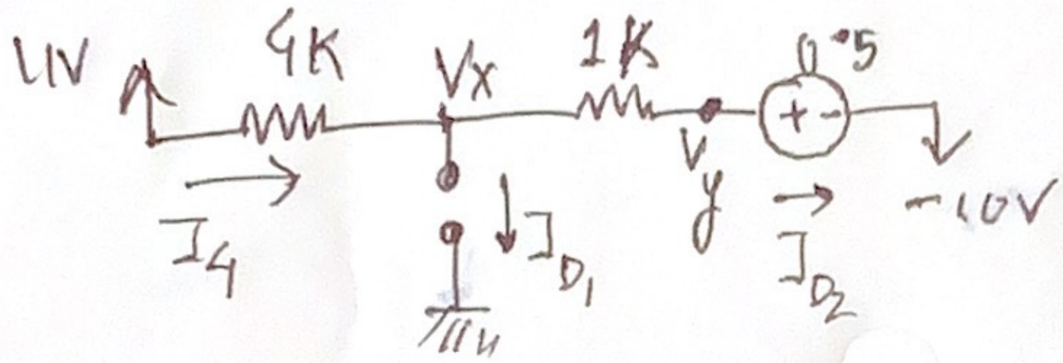
$D_2(OFF) \Rightarrow V_{D_2} = V_y - 10V = -9.5V$

$\therefore V_{D_2} < V_{D_0} \Rightarrow TRUE$

Therefore, assumption correct!



(a) $D_1 = OFF, \quad D_2 = ON$



$$\boxed{V_y = -10 + 0.5 = -9.5V}$$

$I_{D_1} = 0$

$I_4 = I_{D_1} + I_{D_2} \Rightarrow \boxed{I_4 = I_{D_2}}$

$$\boxed{I_4 = I_{D_2} = \frac{11 - (-9.5)}{4+1} = 4.1\,mA}$$

$I_4 = \frac{11 - V_x}{4} \Rightarrow V_x = 11 - I_4 \times 4$

$\Rightarrow \boxed{V_x = -5.4V}$

(b) D_1(OFF): $V_{D_1} = V_x - 0 = -5.4$

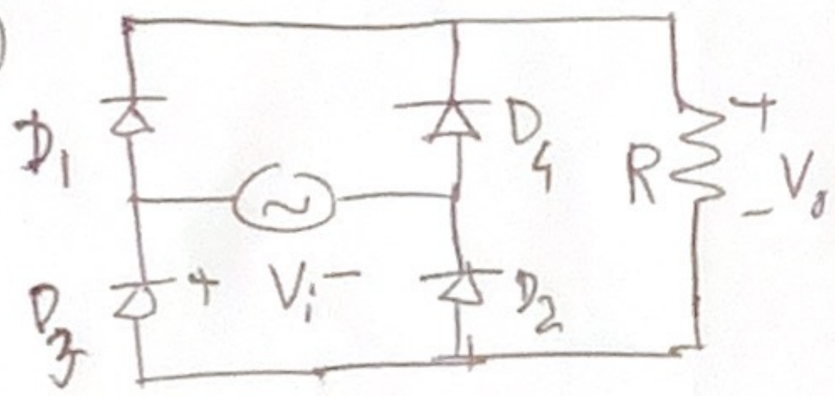
Therefore, $v_{D_1} < V_{D_0} \Rightarrow$ TRUE

D_1(ON): $I_{D_2} > 0 \Rightarrow$ TRUE

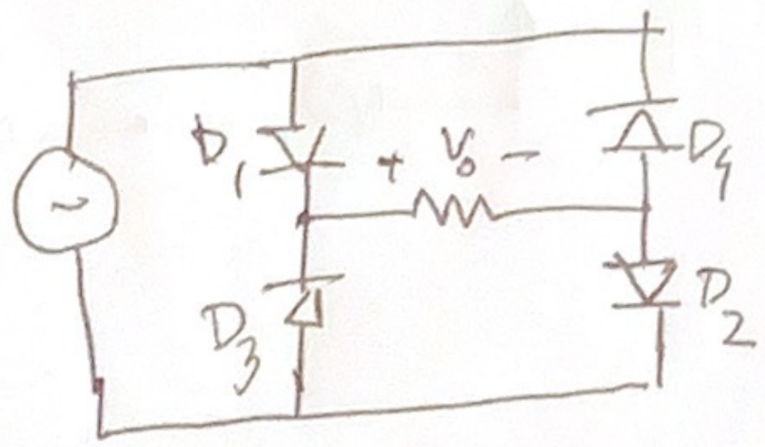
} Therefore, Assumption Correct!

Q4

(a)



OR



(b) $V_M = 10V$

Hence, $V_{Avg} = V_{DC} = \frac{2}{\pi} V_M - 2V_{DO}$

$= \frac{2}{3.14} \times 10 - 2 \times 0.7$

~~$= 5.37V$~~ $= 4.97V$

(c) $V_p = V_M - 2V_{DO} = 8.6V$

$f_R = 2f_i = \frac{2\times\omega}{2\pi} = \frac{2\times 100\pi}{2\pi} = 100Hz$

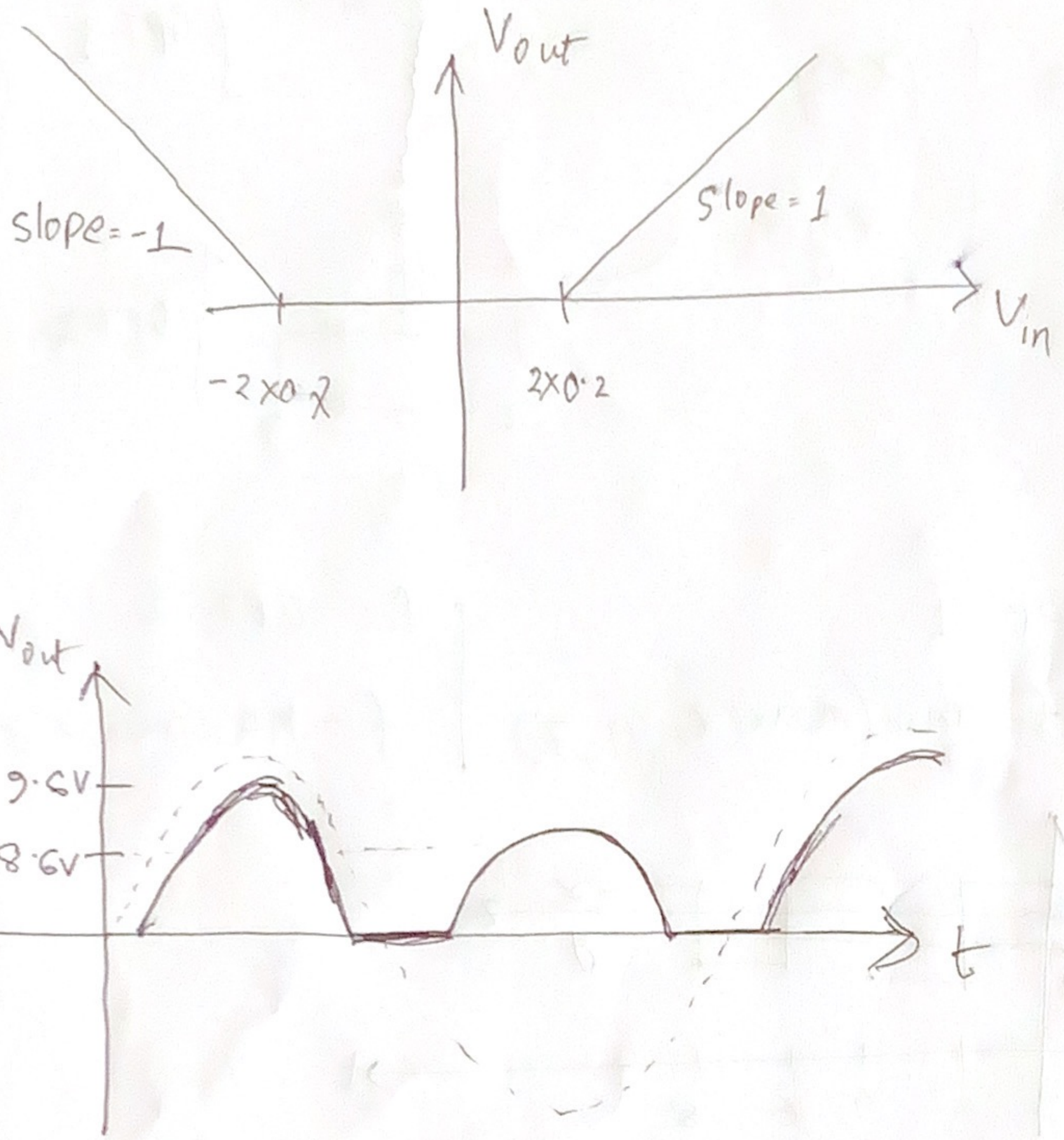
~~$V_p \neq$~~

$V_{ro} = \frac{V_p}{f_R R C} = \frac{8.6}{100 \times 50\times10^3 \times 5\times10^{-6}} =$ ~~1.72~~ 0.344

$\therefore V_{DC} = V_p - \frac{V_{ro}}{2} = 8.6 - \frac{0.344}{2} = 8.428V$

(d) D_1 and D_2.

(e)



$V_p' = V_M - 2V_{D0}$

$= 10 - 2 \times 0.2$

$= 9.6V$