

Find the final function in sop form:

3 possible methods

(i) n network:

$$\begin{aligned}
 V_{out} &= \overline{(A+C)\bar{B} + \bar{A}C} \\
 &= \overline{A\bar{B} + \bar{B}C + \bar{A}C} \\
 &= (\bar{A}+B)(B+\bar{C})(A+\bar{C}) \\
 &= (\bar{A}B+B+\bar{A}\bar{C}+B\bar{C})(A+\bar{C}) \\
 &= (\bar{A}\bar{C}+B\bar{C}+B)(A+\bar{C}) \\
 &= \bar{A}\bar{C} + A\bar{C} + AB + \bar{A}\bar{C}\bar{C} + B\bar{C}\bar{C} + B\bar{C} \\
 &= AB\bar{C} + A\bar{C} + \bar{A}\bar{C} + B\bar{C}
 \end{aligned}$$

$$V_{out} = AB + \bar{A}\bar{C} + B\bar{C}$$

(ii) p network:

$$\begin{aligned}
 V_{out} &= (\bar{A}\bar{C} + B)(A + \bar{C}) \\
 &= \bar{A}\bar{C}A + AB + \bar{A}\bar{C}\bar{C} + B\bar{C}
 \end{aligned}$$

$$V_{out} = AB + \bar{A}\bar{C} + B\bar{C}$$

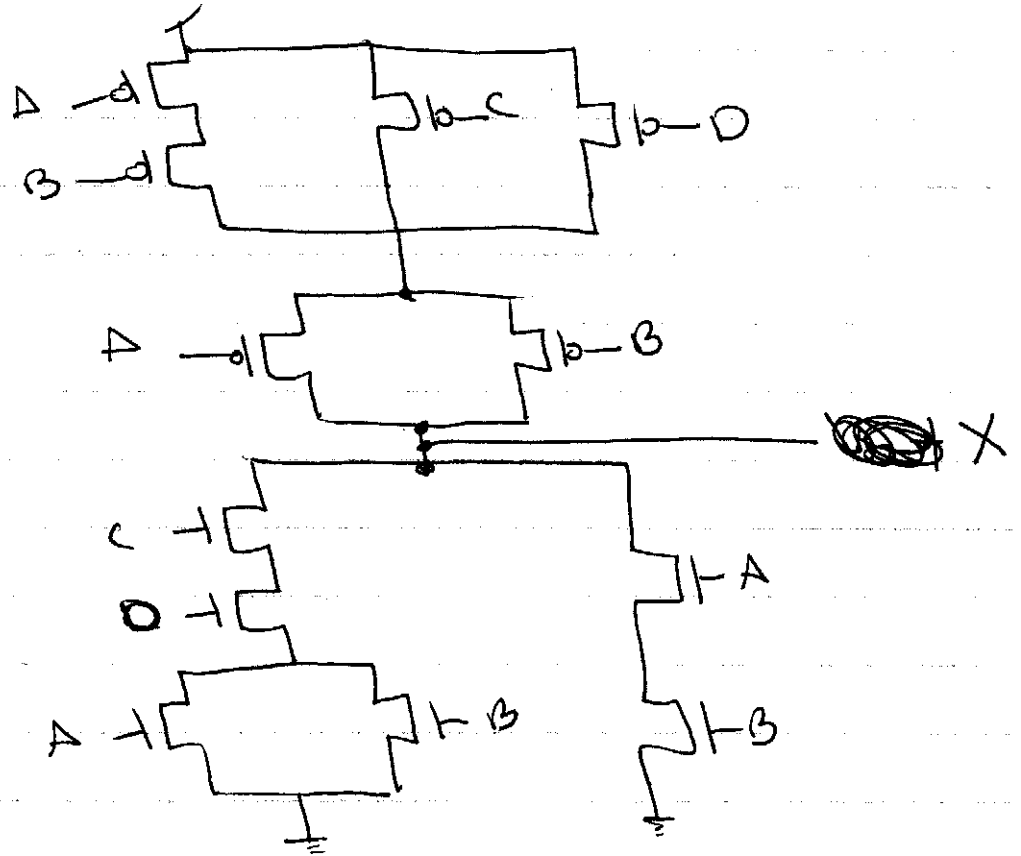
(iii)

		B			
		00	01	11	10
A	0	1	0	0	1
	1	0	0	1	1

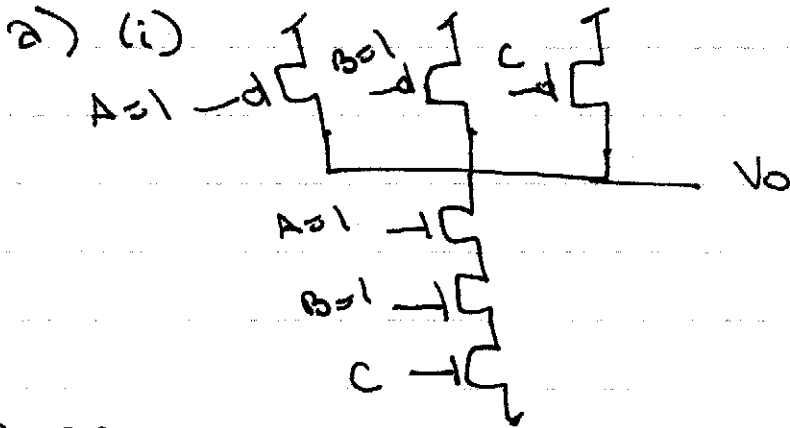
$$V_{out} = AB + B\bar{C} + \bar{A}\bar{C}$$

Problem 2:

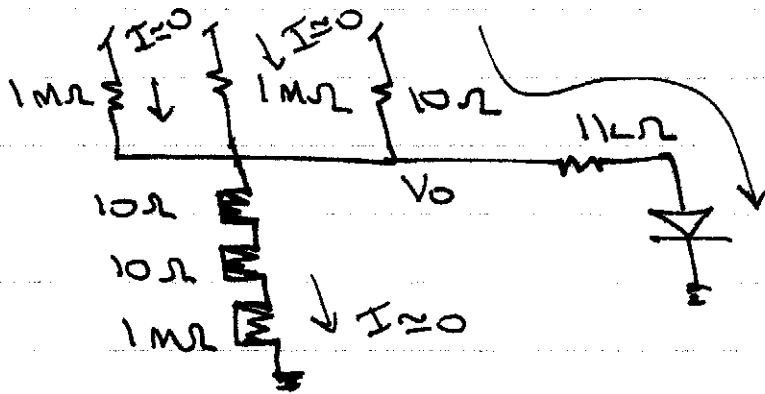
$$X = \overline{(A+B)CD + AB}$$



Problem 3:

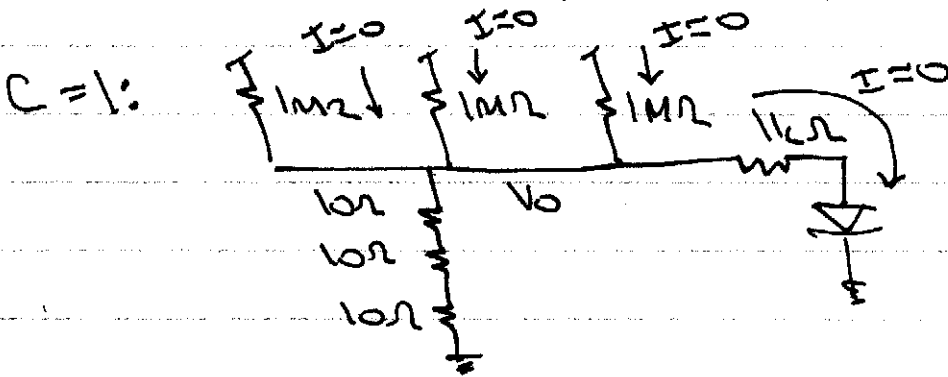


C=0:



V_o is close to V_{DD} , so diode is forward biased

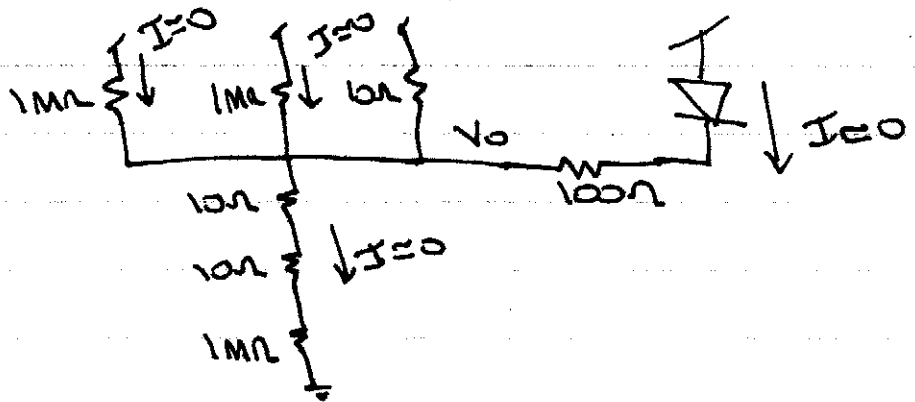
$$V_{OH} = 10\Omega \left(\frac{V_{DD}}{1k\Omega + 10\Omega} \right) = 4.95V = V_{OH}$$



V_o is low, so diode is ~~forward~~ biased off

no I onto V_o , so $V_{OL} = 0V$

(i) $C=0$

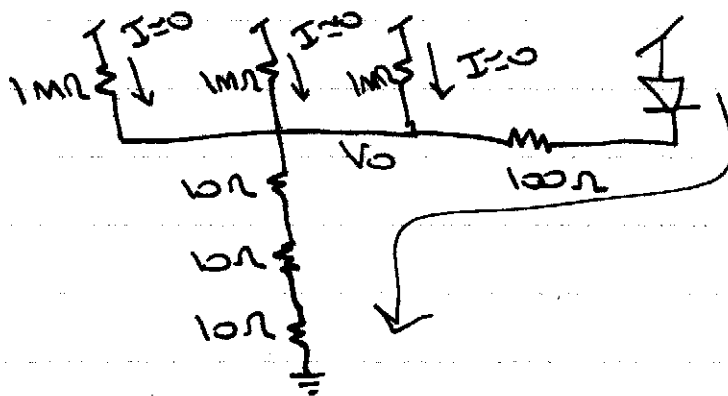


V_o is high, so diode is off.

no I off V_o , so $V_{OH} = V_{DD} = 5V$

(ii)

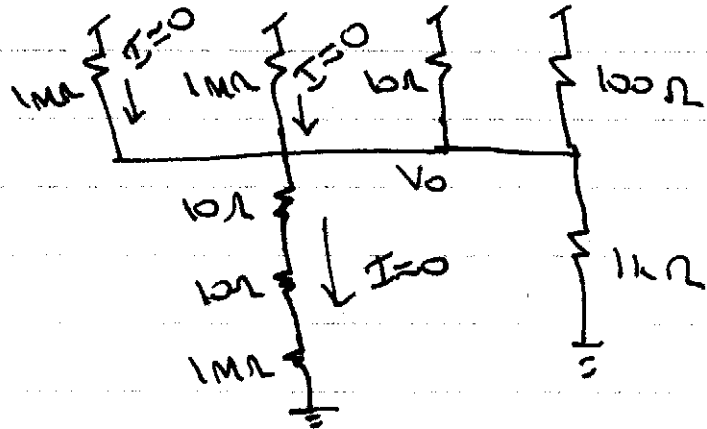
$C=1$



V_o is low, so diode is on

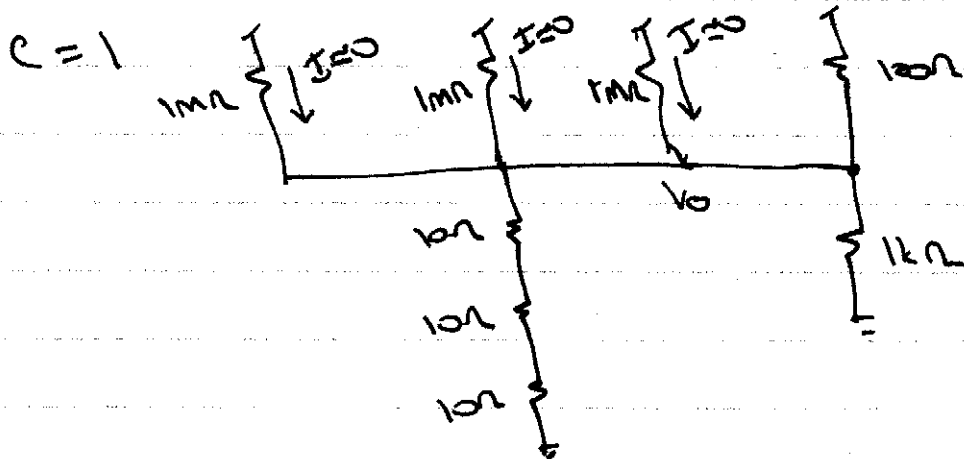
$$V_{OL} = 30\Omega \left(\frac{V_{DD}}{100\Omega + 30\Omega} \right) = \cancel{0.25V} \quad 1.15V = V_L$$

(iii) $C=0$



$$V_{OH} \approx V_{DD} - \frac{V_{DD} (10\Omega \parallel 100\Omega)}{(10\Omega \parallel 100\Omega) + 1k\Omega}$$

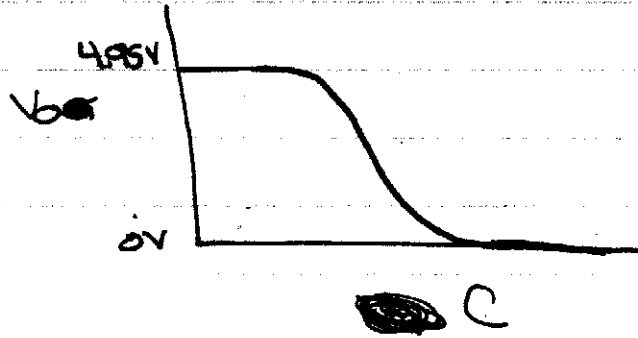
$$V_{OH} \approx 4.95V$$



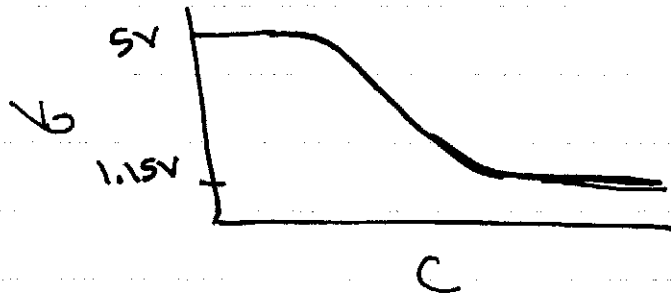
$$V_{OL} \approx (30\Omega \parallel 1k\Omega) \left[\frac{V_{DD}}{(30\Omega \parallel 1k\Omega) + 100\Omega} \right]$$

$$V_{OL} \approx 1.13V$$

b) (i)



(ii)



(iii)

