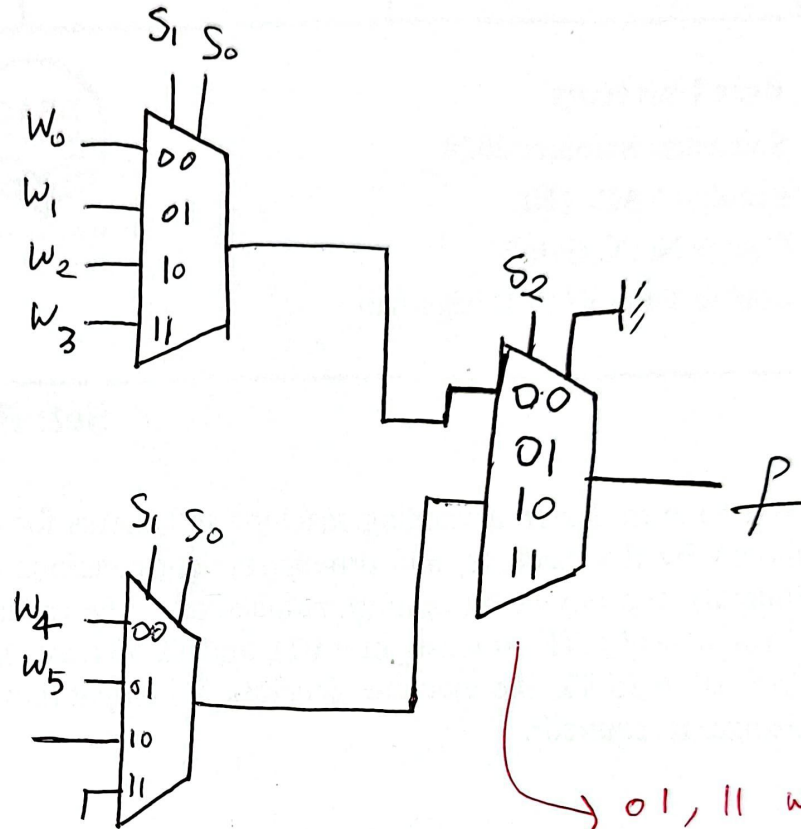


design 6:1 using 4:1 mux

	$S_2$	$S_1$	$S_0$	$f$
{	0	0	0	$w_0$
	0	0	1	$w_1$
	0	1	0	$w_2$
{	0	1	1	$w_3$
	1	0	0	$w_4$
	1	0	1	$w_5$



keep 10,11 disconnected

→ 01, 11 will never  
be selected due to  
GND connection at  
LSB select pin

# VLSI maths

$f = x_2 + x_1 x_3 \rightarrow$  implement using pass T and TG

$x_1$	$x_3$	$f$
0	0	0
0	1	0
1	0	0
1	1	1

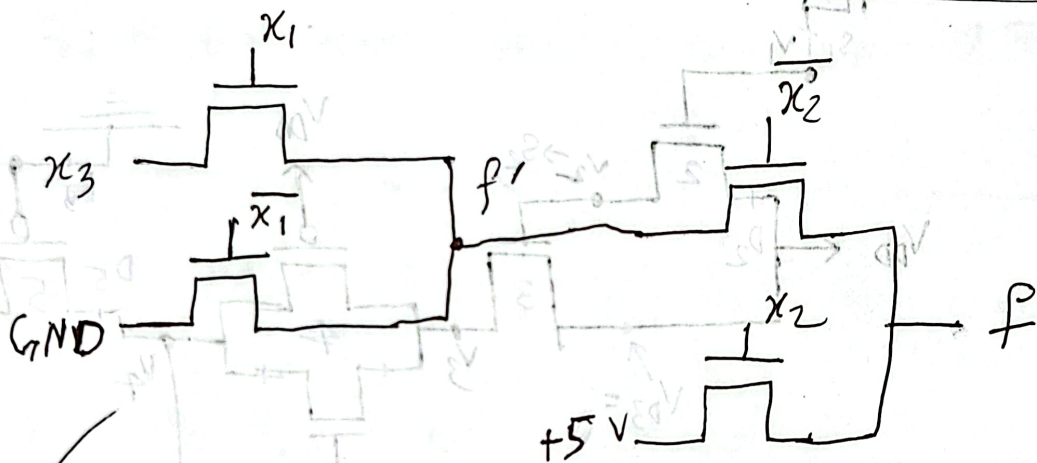
always GND

$x_3$  to copy

$x_2$	$f'$	$f$
0	0	0
0	1	1
1	0	1
1	1	1

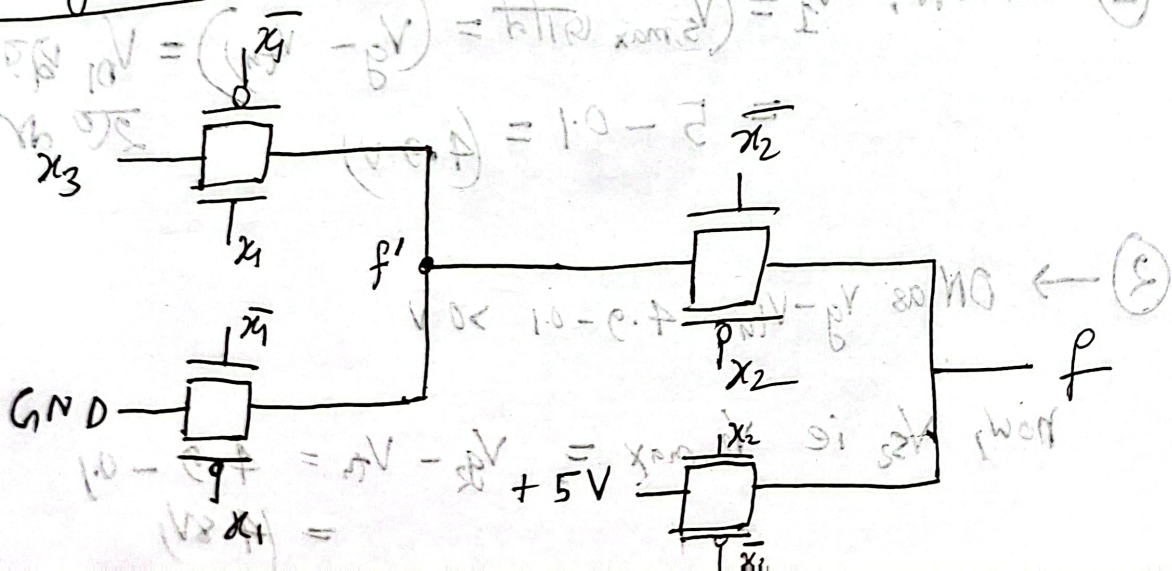
$f'$  to copy

always +5V



using NMOS pass transistors

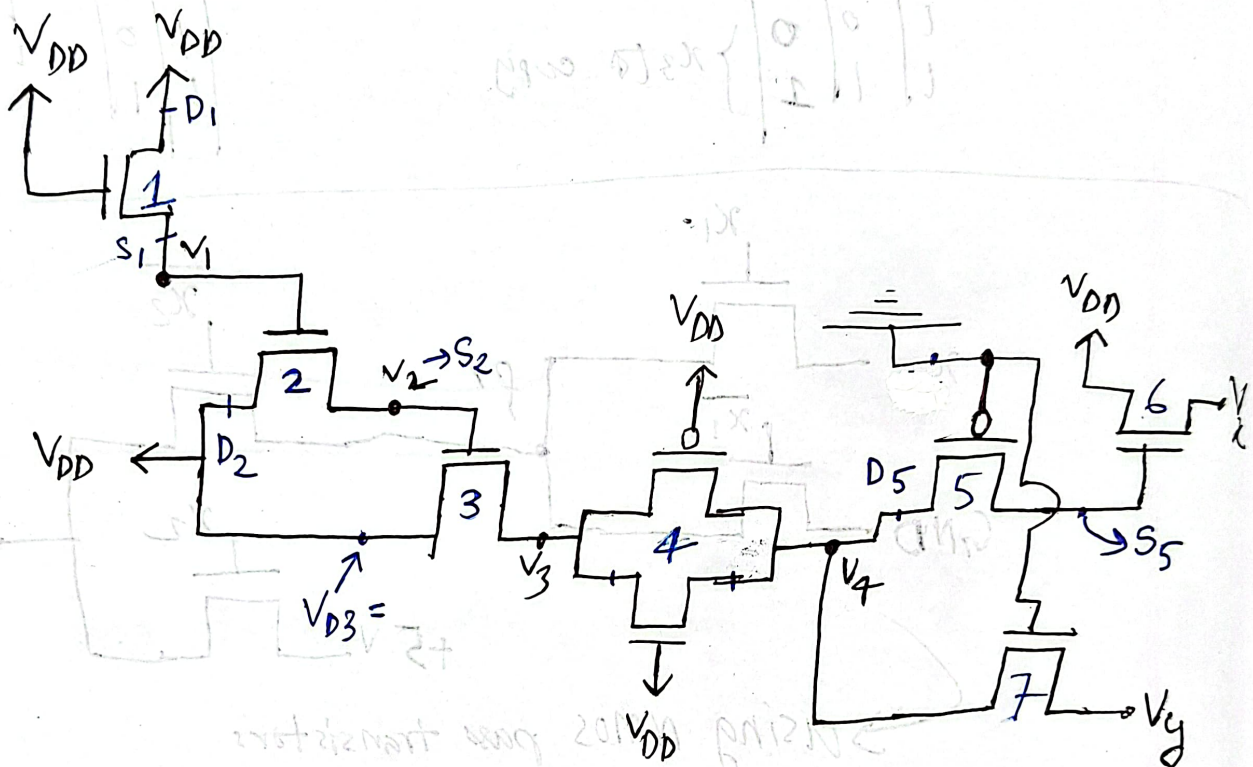
using TG:



Mid solve :

Summer 24 → set 2

4(e)



$V_{th} = |V_{tp}| = 0.1V$  ;  $V_{DD} = 5V$  (given)

① → ON ;  $V_1 = (V_{s,max} \text{ জানি } = (V_g - V_{th})) = V_{D1} \text{ এর পর } 20 \text{ or}$   
 $= 5 - 0.1 = (4.9V)$

② → ON as  $V_g - V_{th} = 4.9 - 0.1 > 0V$

now,  $V_{S2}$  ie  $V_{1,max} = V_{g2} - V_{th} = 4.9 - 0.1$   
 $= (4.8V)$



hence,  $V_{D2} = 5V \rightarrow$  gets degraded as  $V_{L} \text{ mode}$

$$V_2 = (4.8V)$$

$$1.95V < 0.2V$$

(3)  $\rightarrow V_{g3} = 4.8V > 0.1V$  hence ON.

$$V_{3, \max} \text{ can be } = V_{g3} - V_{th} = (4.7V)$$

$$V_{D3} = 5V \text{ here hence } \rightarrow V_3 = V_{S3} = 4.7V$$

(4)  $\rightarrow$  PMOS of T<sub>H</sub> is disabled only NMOS is

ON.  $V_{g4} = 5V$  here and,  $V_{4, \max} = V_{DD} - 0.1 = (4.9)V$

as  $V_{D4} = V_3 = 4.7V < 4.9V \rightarrow V_3$  easily

passes without degradation



$$V_4 = 4.7V$$

$$I = I_{D4} = I_{D3} = I_{D2}$$

(5)  $\rightarrow$  PMOS always ON and for PMOS  $\rightarrow$

$$V_{sg} > |V_{tp}|$$

$$\Rightarrow V_{s, \min} = V_g + |V_{tp}| \rightarrow V_{ss, \min} \text{ or}$$

$$\therefore V_{ss} = V_g = \text{good } 1 = 4.7V$$

---

(6)  $\rightarrow$   $V_{g6}$  of NMOS =  $4.7V > 0.1V$  hence

ON.

$$V_{D6} = 5V$$

but

$$V_{D6} = 5V$$

$$V_{S6, \max} \text{ ie } V_{x, \max} = 4.7 - 0.1 = 4.6V \text{ possible}$$

$$\text{hence } V_{S6} = V_x = 4.6V$$

---

(7)  $\rightarrow$  NMOS always off as  $V_g = 0 < V_{th}$

$$\text{hence, } V_y = \text{floating} = Z$$