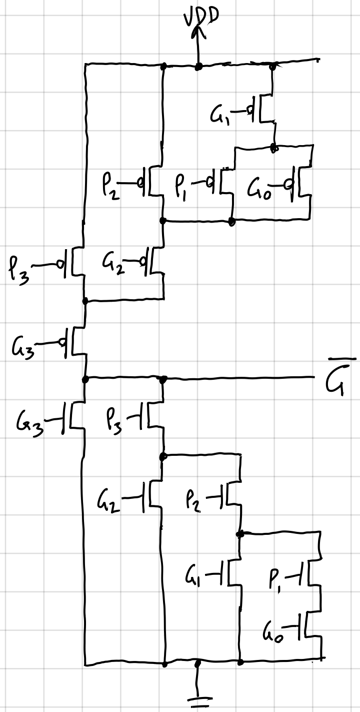
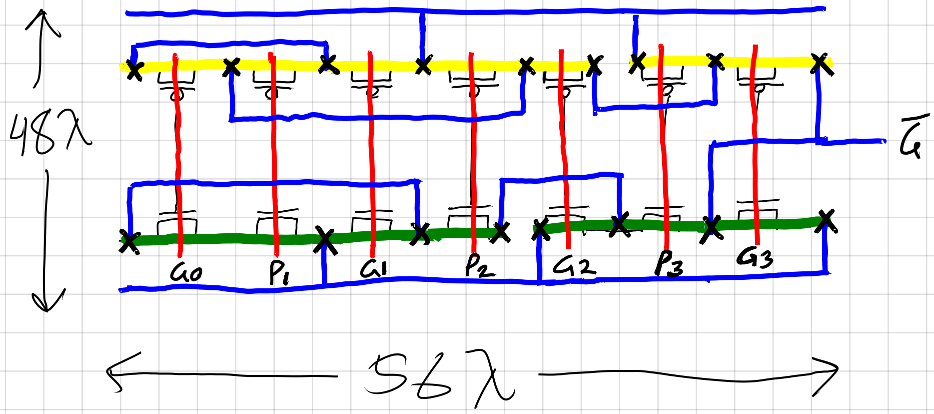
ADAM CARDINGLEY
acc163
HW2 ECSE 485

1

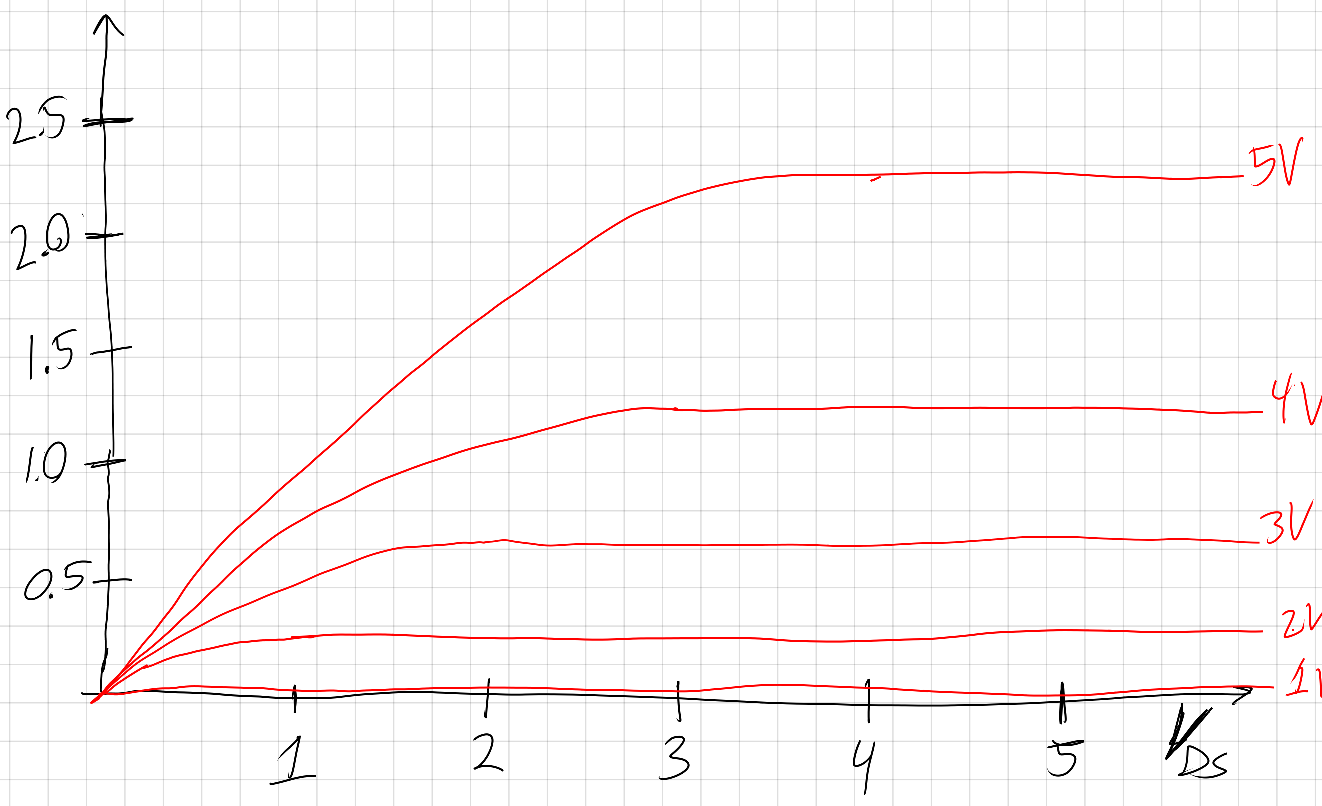
$$f_n = G_3 + P_3(G_2 + P_2(G_1 + P_1 G_0)) \qquad f_p = G_3 \cdot (P_3 + G_2 \cdot (P_2 + (G_1 \cdot (P_1 + G_0))))$$





$$\boxed{c)\ 2688(\lambda^2)}$$

2



③

$$I_{DS1} = \beta_1\left(V_{gs} - V_t - \frac{V_{DS}}{2}\right)V_{DS}$$

$$I_{DS2} = \cancel{\beta_2}\left((V_{DD} - V_1) - V_t - \frac{V_{DS} - V_1}{2}\right)(V_{DS} - V_1) = \cancel{\beta_2}\left(V_{DD} - V_t - \frac{V_1}{2}\right)V_1$$

$$V_{DD}(V_{DS} - V_1) - V_1(V_{DS} - V_1) - V_t(V_{DS} - V_1) - \frac{(V_{DS} - V_1)^2}{2} = V_{DD}V_1 - V_tV_1 - \frac{V_1^2}{2}$$

$$V_{DD}V_{DS} - V_{DD}V_1 - V_1V_{DS} + V_1^2 - V_tV_{DS} + V_1V_t - \frac{(V_{DS} - V_1)^2}{2} = V_{DD}V_1 - V_tV_1 - \frac{V_1^2}{2}$$

4

$$C_g = 3.9\varepsilon_0 \cdot \frac{W \cdot L}{t_{ox}}$$

$$\frac{C_g}{W} = \frac{3.9\,\varepsilon_0 \cdot L}{t_{ox}}$$

$$= \frac{3.9 \cdot 8.85E{-}12\,\tfrac{F}{m} \cdot 90E{-}9\,m}{1.6E{-}9\,m}$$

$$\boxed{1.941 \cdot 10^{-9}\ F/m}$$

5

$$I_{DS} = \frac{\beta}{2}(V_{gs} - V_t)^2$$

$$I_{DS1} = \frac{\beta}{2}(1.2 - 0.4)^2$$

$$\cancel{\frac{\beta}{2}}(0.8)^2 = k \cdot \cancel{\frac{\beta}{2}}(0.9)^2$$

$$0.64 = k\, 0.81$$

$$0.79 = k$$

$$\boxed{b}$$

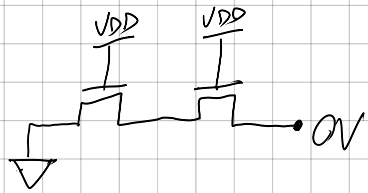
$$I_{DS2} = \frac{\beta}{2}(1.2 - 0.3)^2$$

$$\boxed{a}$$

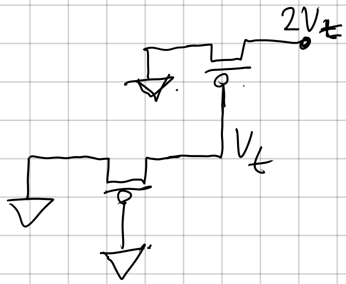
$$\frac{1}{k} = \boxed{1.266}$$

⑥

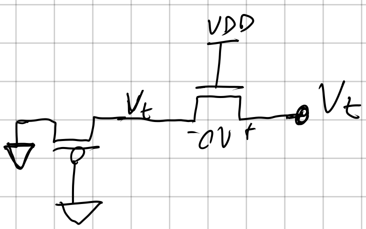
(a)



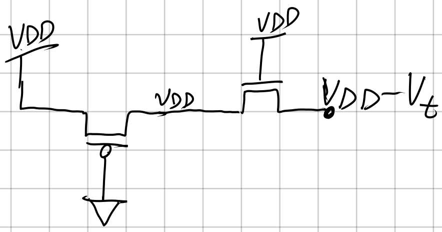
(b)



(c)



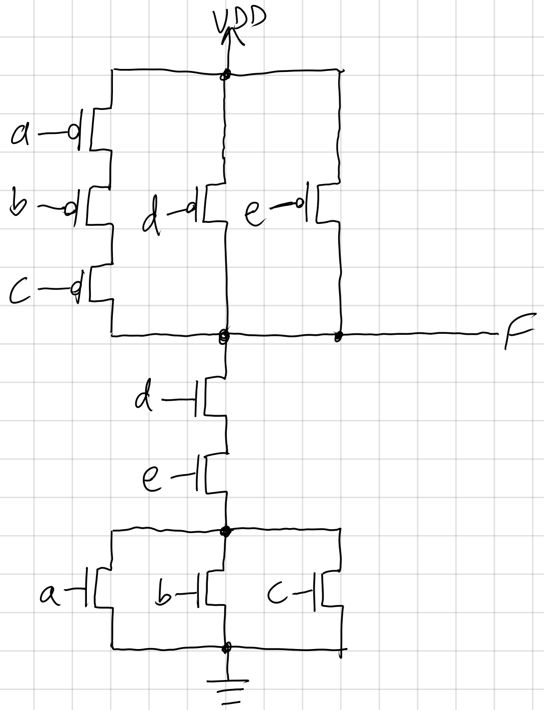
(d)



7

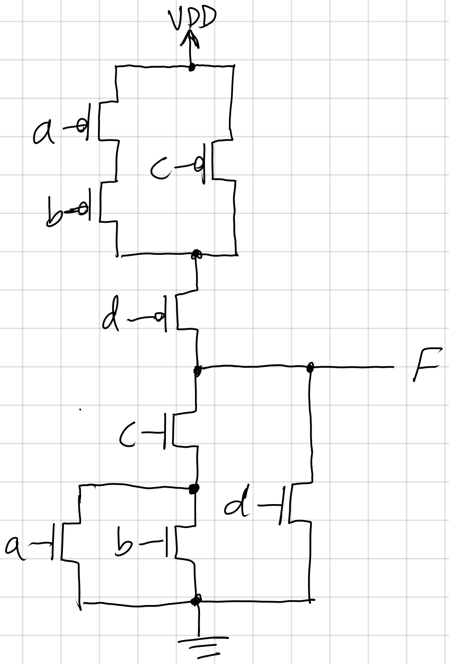
a. $f_n = (a+b+c)de$

$f_p = abc + d + e$



b. $f_n = ((a+b)c) + d$

$f_p = (ab+c)d$



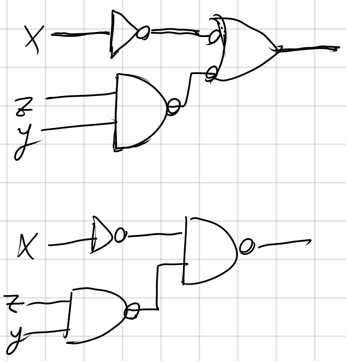
c. $F = (x+y)(x+z)$

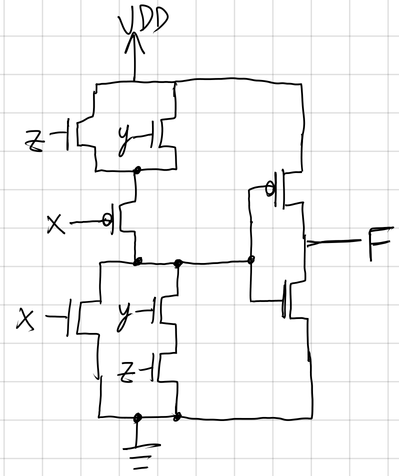
$F = x(x+y) + z(x+y)$

$F = x + zx + zy$

$F = x + zy$

$F = \overline{x' \cdot (zy)'}$

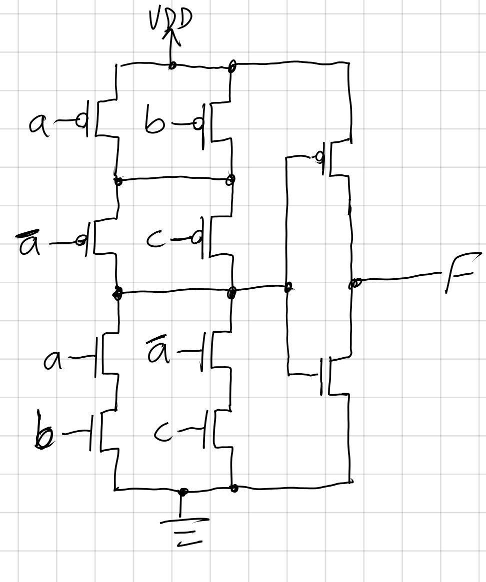




d. $F = ab + a'c + b\cancel{c}d$

cd \ ab	00	01	10	11
00				1
01				1
10	1	1		1
11	1	1		1

c	b	a	F
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1



$f_n = ab + a'c$

$f_p = (a+b)(a'+c)$ + ⊳○ = F