$V_{DD} = 1.5V$
$k'_n = 100 \mu A/V^2$
$V_{tn} = 0.4V$
$\lambda_n = 0.1 V^{-1}$
$\left(\frac{W}{L}\right)_n = 10$
$k'_p = 60 \mu A/V^2$
$V_{tp} = -0.4V$
$\lambda_p = 0.2 V^{-1}$
$\left(\frac{W}{L}\right)_p = 17$

Connect 100fF cap to output:
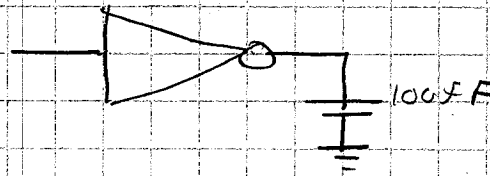
$$t_{pLH} = \frac{C_L \, V_{DD}/2}{I_{ave}} \Rightarrow I_{av} = \frac{I_a + I_c}{2}$$
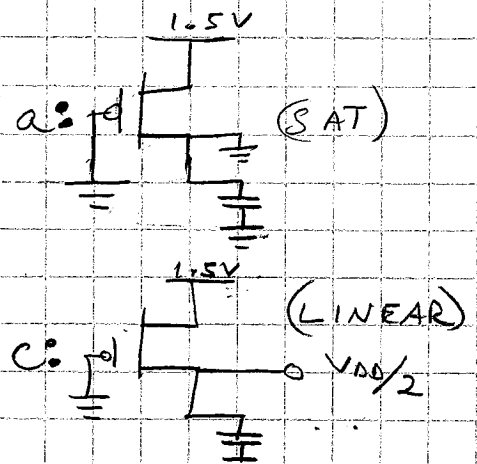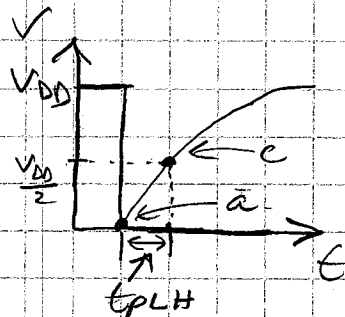
$$I_a = \frac{k'_p}{2} \left(\frac{W}{L}\right)_p \left(V_{Gd} - |V_{tp}|\right)^2 \left(1 + \lambda_p V_{sd}\right)$$

$$= \frac{60 \mu A/V^2}{2} (17)(1.5 - 0.4)^2 [1 + (0.2)(1.5)] = \underline{802.23 \mu A}$$

$$I_c = k'_p \left(\frac{W}{L}\right)_p \left[\left(V_{Gd} - V_{td}\right)|V_{DD/2}| - \frac{(V_{DD}/2)^2}{2}\right]$$

$$= 60 \mu A/V^2 \, (17) \left[(1.5 - 0.4)(0.75) - \frac{(0.75/2)^2}{2}\right] = \underline{769.78 \mu A}$$

$$I_{ave} = \frac{I_a + I_c}{2} = 786.01 \mu A$$

$$R_{out} = \frac{V_{DD}/2}{.69 I_{ave}} = \frac{0.75}{(0.69)(786.01 \mu A)} = \boxed{1.377 \, k\Omega}$$

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HW-10

$$\tau_{Di} = \sum_{k=1}^{N} R_{ki} C_k = ?$$

$$\left(1.377k\Omega + 120\Omega\right)\left(75fF + 15fF + 45fF + 50ff\right)$$

$$+ \left(1.377k\Omega + 120\Omega + 165\Omega\right)\left(100fF + 95fF\right)$$

$$+ \left(1.377k\Omega + 120\Omega + 165\Omega + 105\Omega\right)\left(65fF\right)$$

$$+ \left(1.377k\Omega + 120\Omega + 165\Omega + 105\Omega + 220\Omega\right)\left(200fF\right)$$

$$= 276.93ps + 55.58ps + 25.35ps + 122ps$$

$$\tau_{Di} = \boxed{479.85ps}$$