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Homework 10 Solutions

10.1 Logic Functions

a) The logic function for Vout1 is

$(\overline{A1 + B1})$

b) The logic function for Vout2 is

Vout2 = ((B2*C2) + A2)

c) What is the propagation delays of this circuit in terms of inverter delays?

$\tau_{PD_CASCADE} = \tau_{PD_1} + \tau_{PD_2}$

 $Tpd_1 = 2Tinv$ and $Tpd_2 = 2Tinv$

Therefore, $\underline{Tpd}\underline{-cascade} = 4\underline{Tinv}$

10.2 Average Resistances Use the circuit to the right.

a) Evaluate the equivalent resistance of the pull down network for Vdd=5V, Vth=1V, Vin= 2V and Vout_sat=1V Use:

$$I_{OUT-SAT-n} = k_n \left(\frac{W}{L}\right)_n \left(V_{IN} - V_{Tn}\right) V_{OUT-SAT-n}$$

We find for Vdd = 5V, Iout_sat = $200\mu A$ Reqn = $\frac{3}{4}$ Vdd/Idsat = $\frac{3}{4}$ (5V)/($200\mu A$) = $25K\Omega$

b) Evaluate the equivalent resistance for Vdd=3V, Vth=0.43V, Vin=2V and Vout_sat=0.63V

We find for Vdd = 3V, Iout_sat = 197.82μ A Reqn = $\frac{3}{4}$ Vdd/Idsat = $\frac{3}{4}$ (3V)/(197.82 μ A) = 15K Ω

