

Name: Key

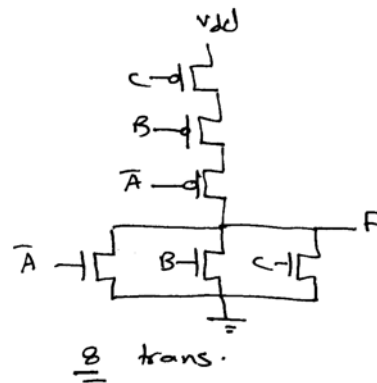
Id#

COE 360, Principles of VLSI Design, Term 043  
Quiz# 2

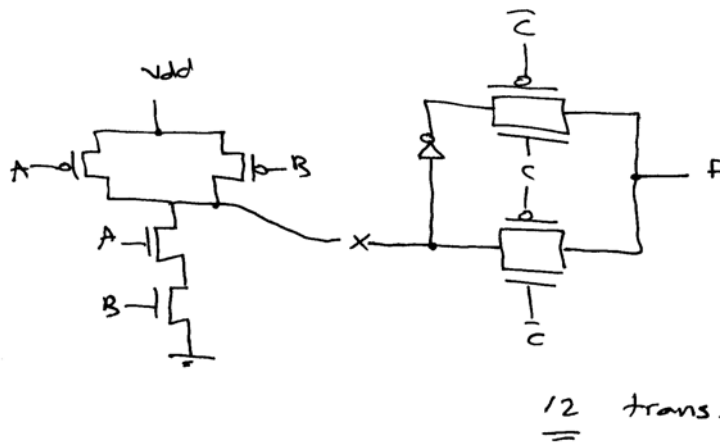
Date: Sunday, July 16, 2005

Q1. Implement the following functions using CMOS with the smallest number of transistors possible. Note that transmission gates are to be used whenever this leads to a better implementation. Indicate the number of transistors needed for your implementation including the ones needed for inverting the inputs:

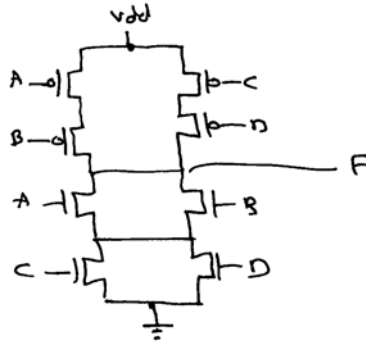
$$\begin{aligned} (1) \quad F &= A (A (B+C))' \\ &= A \cdot [\bar{A} + \bar{B}\bar{C}] \\ &= A \bar{B}\bar{C} \\ &= [\bar{A} + B + C]' \end{aligned}$$



$$(2) \quad F = \frac{ABC}{x} + \frac{(AB)'C'}{x} = \bar{x}c + xc\bar{c}$$



(3)  $F = [AC + AD + BC + BD]'$   
 $= [A(c + D) + B(c + D)]'$   
 $= [(A + B)(c + D)]'$



B = trans.

(4) D-Latch.

