

CSM151B Homework #3

CSM151B

Fan-In	Delay
1	T
2	$2T$
3	$3T$
4	$5T$
5	$7T$
6	$10T$
7+	$2T \times \text{Fan-in}$

*Mux = $4T$ (regardless of fan-in)

Output	Delay
G_0	$a_0 b_0 = 2T$
P_0	$a_0 \oplus b_0 = 2T$
G_1	$G_3 + G_2 P_3 + G_1 P_2 P_3 + G_0 P_1 P_2 P_3 = 7T + 5T = 12T$
P_1	$P_0 P_1 P_2 P_3 = 7T$
C_{12}	$G_7 + G_8 P_7 + G_9 P_8 P_7 + G_0 P_9 P_8 P_7 = 15T + 5T = 20T$
C_{15}	$G_{15} + G_{14} P_{15} + G_{13} P_{14} P_{15} + G_{12} P_{13} P_{14} P_{15} = 25T + 5T = 30T$
C_{16}	$G_0 + G_7 P_0 + G_8 P_7 P_0 + G_9 P_8 P_7 P_0 + G_0 P_9 P_8 P_7 P_0 = 17T + 7T = 24T$
S_{15}	$(a_{15} \oplus b_{15}) \oplus C_{15} = 30T + 2T = 32T$
C_{20}	$G_{19} + G_{18} P_{19} + G_{17} P_{18} P_{19} + G_{16} P_{17} P_{18} P_{19} + (1 0) P_{16} P_{17} P_{18} P_{19} = 9T + 7T = 16T$
S_{19}	$(a_{19} \oplus b_{19}) \oplus C_{19} = 12T + 2T = 14T$
	$C_{19} = G_{18} + G_{17} P_{18} + G_{16} P_{17} P_{18} + (1 0) P_{16} P_{17} P_{18} = 12T$
C_{24}	$G_{23} + G_{22} P_{23} + G_{21} P_{22} P_{23} + G_{20} P_{21} P_{22} P_{23} + (20 20) P_{20} P_{21} P_{22} P_{23} = 23T + 7T = 30T$
C_{31}	$G_{30} + G_{29} P_{30} + G_{28} P_{29} P_{30} + (28 28) P_{28} P_{29} P_{30} = 49T + 5T = 54T$
	$C_{18} = G_{27} + G_{26} P_{27} + G_{25} P_{26} P_{27} + G_{24} P_{25} P_{26} P_{27} + G_{23} P_{24} P_{25} P_{26} P_{27} = 37T + 7T = 44T$
$C_{32} \text{ (After Mux)}$	$G_{31} + G_{30} P_{31} + G_{29} P_{30} P_{31} + G_{28} P_{29} P_{30} P_{31} + (28 28) P_{28} P_{29} P_{30} P_{31} = 51T + 7T + 4T = 62T$
$S_{31} \text{ (After Mux)}$	$\max(C_{16}, (a_{31} \oplus b_{31}) \oplus C_{31}) + 4T$ $\max(24T, 54T + 2T) + 4T = 60T$

Maximal Delay $\Rightarrow \max(C_{32}, S_{31})$
 $\max(62T, 60T) = 62T$