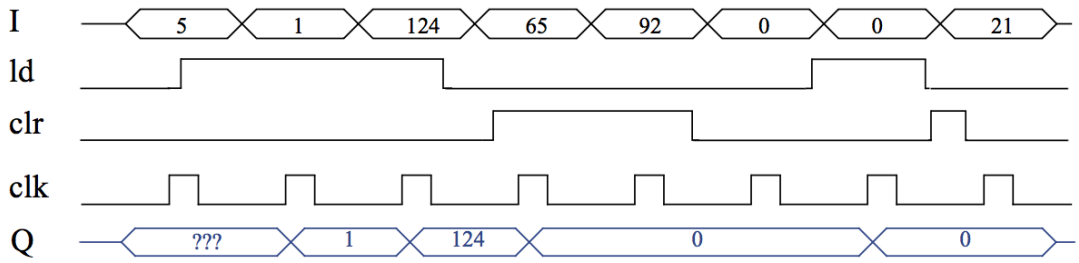
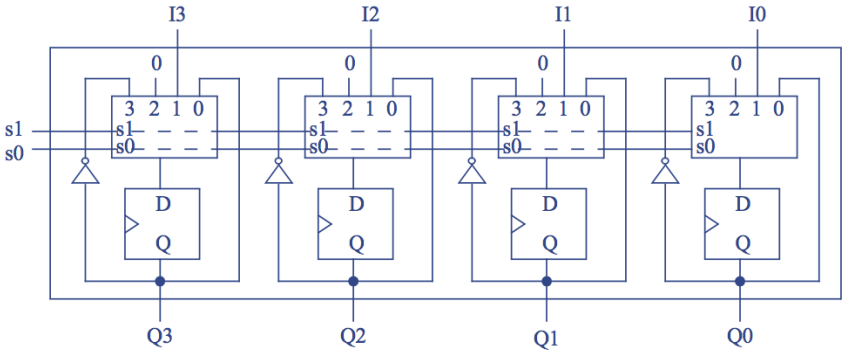
Computer Organization
Homework Set # 2

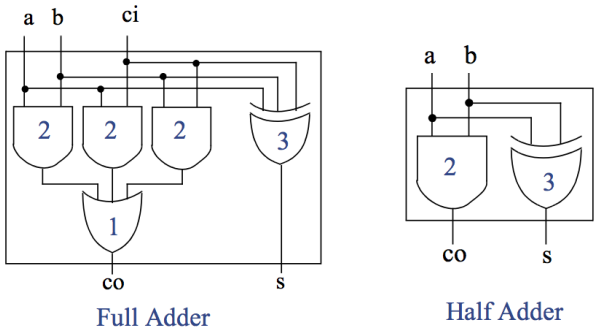
4.2 Solution: (10', 2.5' each number)



4.3 Solution: (10', should be all correct, careless mistakes -2')



4.10 Solution: (10', only shows final answer without workout gets 4')

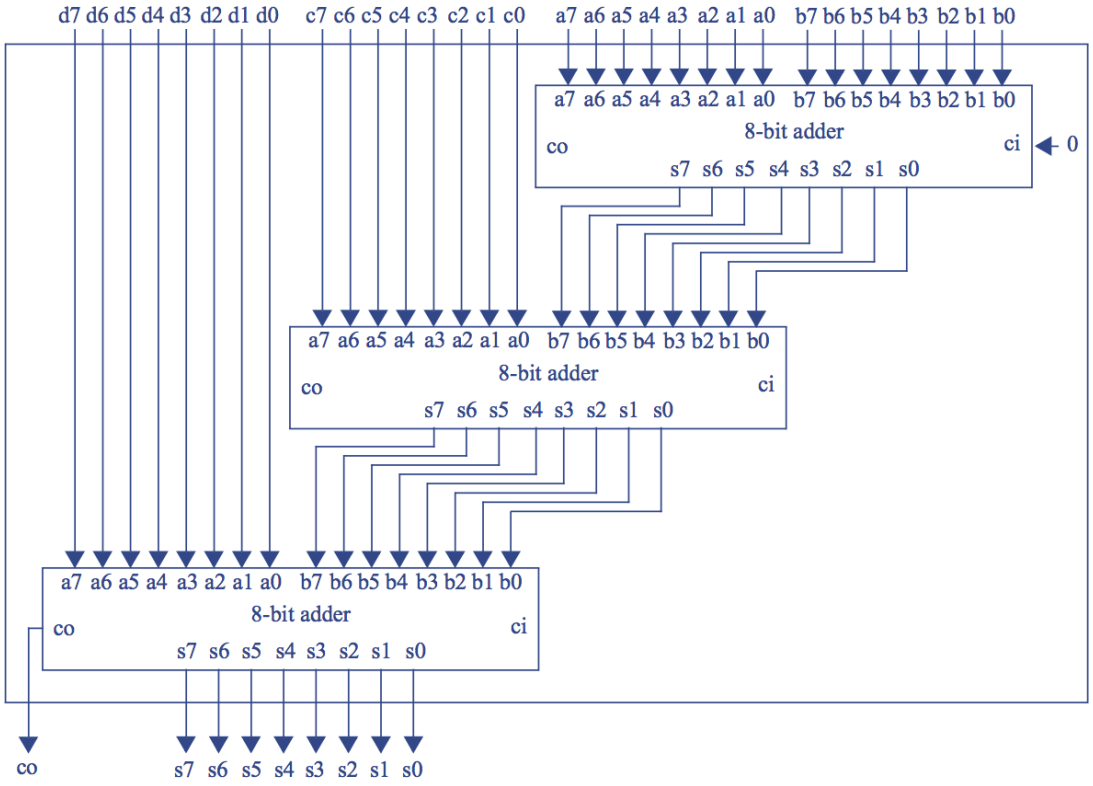


From the illustration above, we see that both the FA and HA have a maximum gate delay of 3 ns. Therefore, 8 adders * 3 ns/adder = 24 ns is required for an 8-bit carry- ripple adder to ensure a correct sum is on the adder's output.

An answer of 23 ns is also acceptable since the carry out of a half-adder will be correct after 2 ns, not 3 ns, and a half-adder may be used for adding the first pair of bits (least significant bits) if the 8-bit adder has no carry-in.

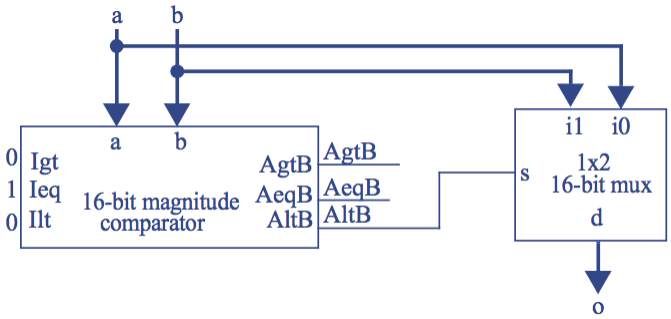
4.13 Solution: (10', should be all correct, careless mistakes -2')

((A+B)+C)+D



Another correct solution would add C+D, and then add the results to the result of A+B. That solution also uses just three adders, but actually has less delay. (A+B)+(C+D)

4.21 Solution: (10', should be all correct, careless mistakes -2')



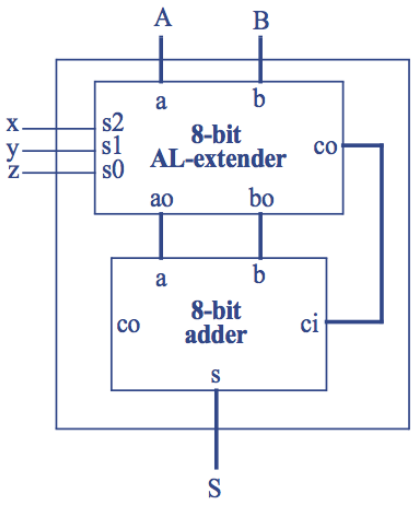
4.30 Solution: (5', 1' each)

a) -32
b) 127
c) -16
d) -64
e) -32

4.33 Solution: (10' all correct, 0 all wrong, -1' per wrong answer)

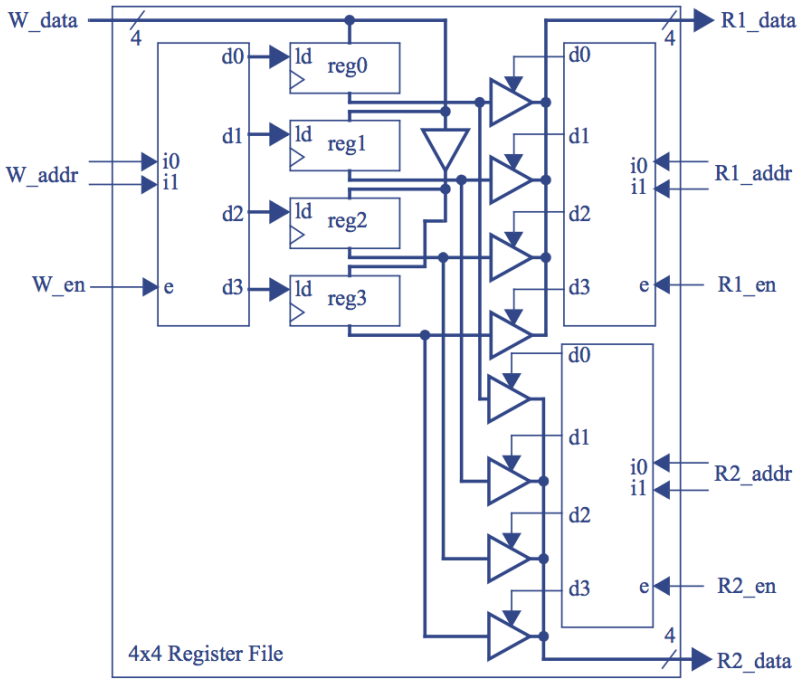
a) 00011101
b) 01100100
c) 01111101
d) 11100011
e) 10011100
f) 10000011
g) 11111110

4.40 Solution: (10': 2' for design architecture, 1' for each operation)



Operation of the AL-extender:
When xyz=000, ao=a, bo=b', co=1
When xyz=001, ao=a, bo=b, co=0
When xyz=010, ao=a<<3, bo=0, co=0
When xyz=011, ao=a>>3, bo=0, co=0
When xyz=100, ao=a NAND b, bo=0, co=0
When xyz=101, ao=a XOR b, bo=0, co=0
When xyz=111, ao=a reversed, bo=0, co=0
When xyz=111, ao=NOT a, bo=0, co=0

4.62 Solution: (10', should be all correct, careless mistakes -2')



4.64 Solution: (10', should be all correct, careless mistakes -2')
a) W_data = 1110, W_addr = 11, W_en = 1, R_addr = 11, R_en = 1

b) Before rising edge:
R0 = 0101
R1 = 0101
R2 = 0101
R3 = 0101
R_data = 0101

After rising edge:
R0 = 0101
R1 = 0101
R2 = 0101
R3 = 1110
R_data = 1110