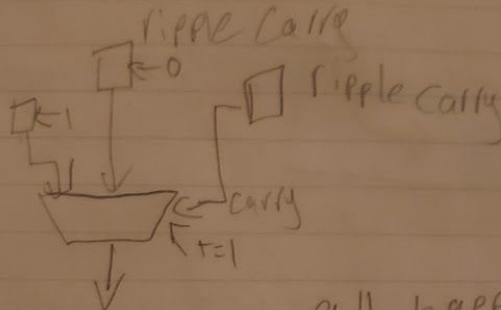
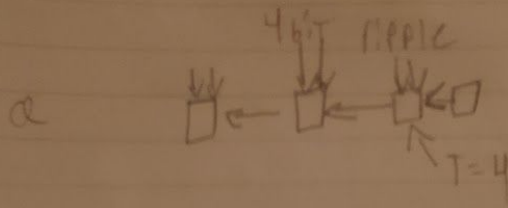


EC 413 HW 3

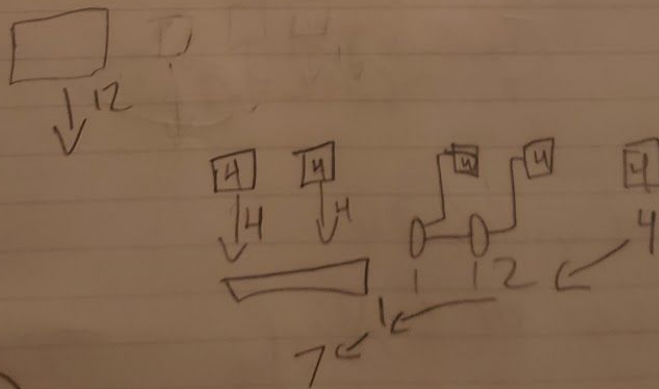
P1.  
P2.



$T=5$

all happen in || So  $T=4+1$

b.



$T=7$

c. So The TD to add another stage is 2

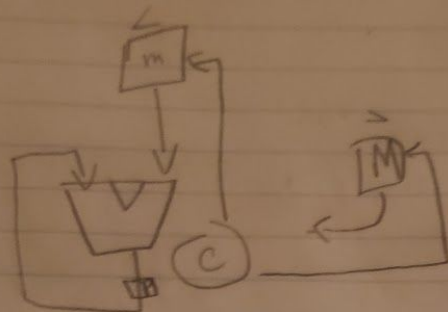
$T=10$   
4 bit adders  
2 adders

$$\begin{aligned} 2 \quad 32 + 2 \cdot 1 &= 34 \\ 4 \quad 16 + (2 \cdot 2) &= 20 \end{aligned}$$

$$\begin{aligned} 8 \quad 8 + (2 \cdot 2) &= 12 \\ 6 \quad 4 + (2 \cdot 2) &= 10 \\ 32 \quad 2 + (2 \cdot 2) &= 18 \end{aligned}$$

p3.

a.)



1 Cycle Worst path  
add multiplicand  
S1 Check last bit multiplier: 1  
S2 add multiplicand to product: 64  
S3 Shift both  
go to 1  
T<sub>per Cycle</sub> = 34  
T = 66.32 = 2112

32 cycles

b.)

Number cycles = 32

Cost Per Cycle:

S1: Check last bit  
S2: add multiplicand to product  
S3 Shift both

T = 34.32 = 1088

P4.

Steps	software	Hardware
1	= 4	14
1a	= 4	124
2	= 4	2/3 4
3	= 4	
Time per cycle:	16	12
PBH3.4 Time	Tot: $16 \cdot 32 = 512$	$12 \cdot 32 = 384$

P5.

a.)  $2N$

b.)  $2(N+1) + 2(n-1) + 1$

c.) it is faster because many more of the computations happen in parallel

P6. Couldn't figure out which example was being referred to

P7.)

63, 25

$$\begin{array}{r|l} \downarrow & \\ 111111 & \begin{array}{l} 0.25 \times 2 \quad | \quad 0.5 \quad | \quad 0 \\ 0.5 \times 2 \quad | \quad 1 \quad | \quad 1 \\ 0 \times 2 \quad | \quad 0 \quad | \quad 0 \end{array} \end{array}$$

$$\begin{array}{l} \overline{111111}.0100 \dots \\ \underline{1.111110} \times 2^5 \rightarrow \end{array} \quad \begin{array}{l} \text{sign exp} \\ 0 \quad | \quad \underline{10000100} \quad | \\ 5+127=132 \end{array}$$

$$\rightarrow [0100 \ 0010 \ 0111 \ 1101 \ 0000 \ 0000 \ 0000 \ 0000]$$

P8.)

1 4 4  
s exp frac

large negative exponent 1 fractional bit

a. 0 1111 0001

large positive exp large fractional

b. 0 0111 1111

c. 0 0001 0011

d. 0 0000 1111

-D  
need 0.9999  
0.99999 x 2 = 0.19998  
all 1  
0.11111111

e.) sign  
0

0 110 1010

↓ ↓

6

-1

1.040

1.002

f.) 0 1010 0100

↓

10-7=3

0.000  
10.0

2 X

0 1111 0000

↓

15-7=8

0.00000000

g.)

0 1010 0100

↓

10-7=3

↓

2 X

0 0101 0001

5-7=3

0.001

0.002

h.) 0 1000 0011  
↓ 8-1 3

0 0111 0111  
7-0 1

$$3-1=\textcircled{2}$$

i 0 1000 → 2  
↓ 8-1

0 0011  
3 → 5 1111

0.01111-2015

0.015