Sept -26

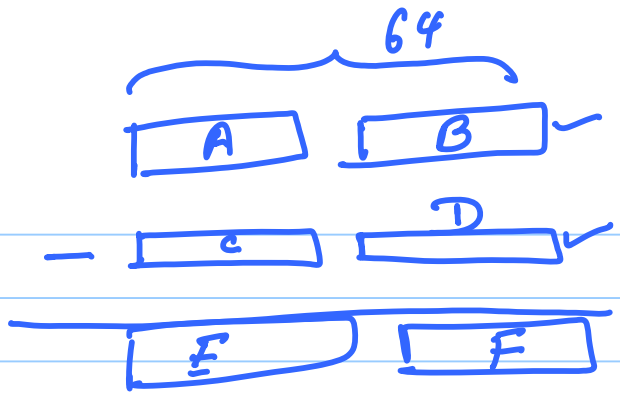
Note Title 26-09-2011

Syllabus → Upto 21st

- Class Notes
- chapter 1-3 (Book)
- Notes on Adder & FP

Focus: O notation

Be very clear about O(log(n)) what does it



mean ?

Vacation
4 - 9th.

1

```
SUBS F, B, D
SBC  E, A, C
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(F = B - D)

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F = B - D
E = A - C
if (D > B)
    E --;
```
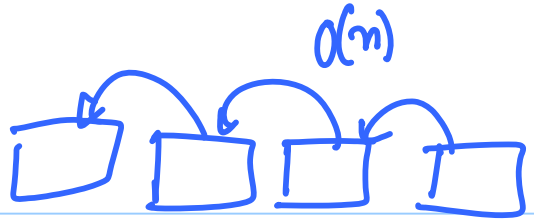

D > B

unsigned comparison.



Carry Lookahead Adder.

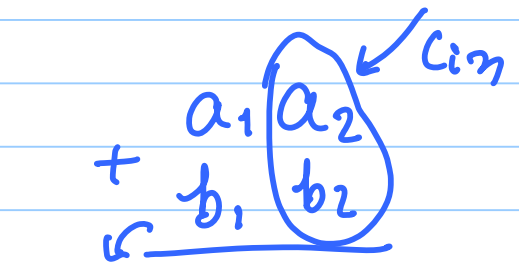
a $+c_{in}$
$+\ b$
C_{out} Sum

$G = ab$

$\oplus \rightarrow$ XOR.

$P = (a \oplus b)$
(if c_{in} is 1
C_{out} is 1)

$C_{out} = G + P C_{in}$



$G_2 = G_1 + P_1 G_2$

$P_2 = P_1 P_2$

Invariant:
$C_{out} = G + P C_{in}$

$$\begin{Bmatrix} a_k & a_{k-1} & \cdots & a_1 \\ b_k & b_{k-1} & \cdots & b_1 \end{Bmatrix}$$

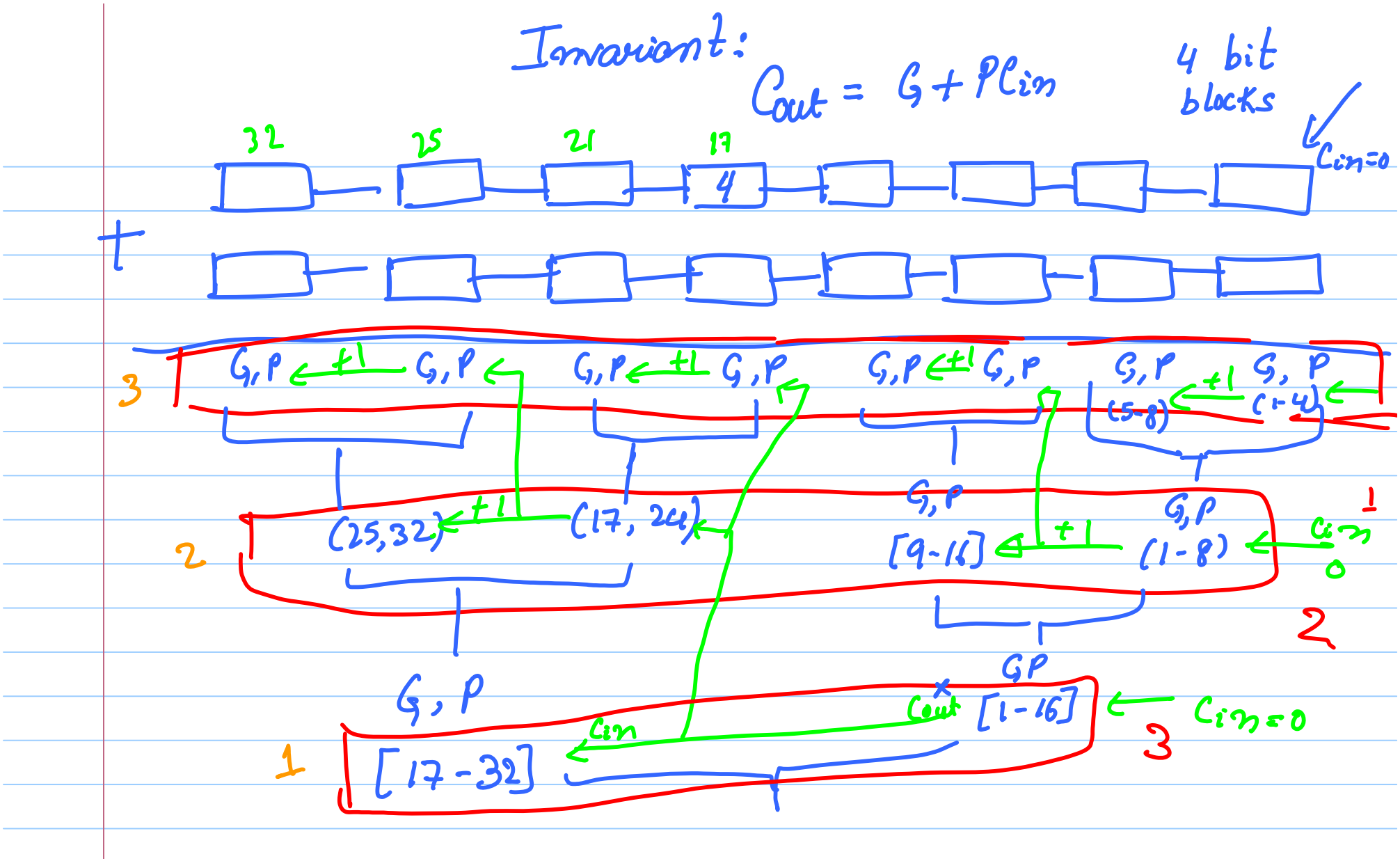
G_2, P_2 $\quad$ G_1, P_1

$a_k \cdots a_2 \quad a_{2-1} \cdots a_1$

$$G = G_2 + P_2 G_1$$
$$P = P_1 P_2$$

$a_k \cdots a_2 \quad a_{2-1} \cdots a_i$

$$G_{ik} = G_{ik} + P_{2k} \cdot G_{i,2-1}$$
$$P_{ik} = P_{i,2-1} \cdot P_{2k}$$


Invariant:
Cout = G + PCin
4 bit blocks
32
25
21
17
4
Cin=0
t
3
G,P ←t1 G,P
G,P ←t1 G,P
G,P ←t1 G,P
G,P ←t1 G,P
(5-8)
(1-4)
2
(25,32) ←t1 (17,24)
G,P
[9-16] ←t1
G,P
(1-8)
Cin 0
1
2
G,P
Cout
[1-16]
Cin=0
3
G,P
Cin
1
[17-32]

$[1-32]$

$C_{out} = G_{32} + P_{32} \cdot C_{in}^{(0)} = G_{(1,32)}$

Stage I

$\log(n)$ steps : Generate & propagate signals (tree fashion) $\log(n)$

$O(\log(n))$

Stage II : Compute the carry

You have → values of C_{in} for every block. $\log(n)$

Stage III :

Do a ripple carry addition with the value of c_{in}

$O(1)$

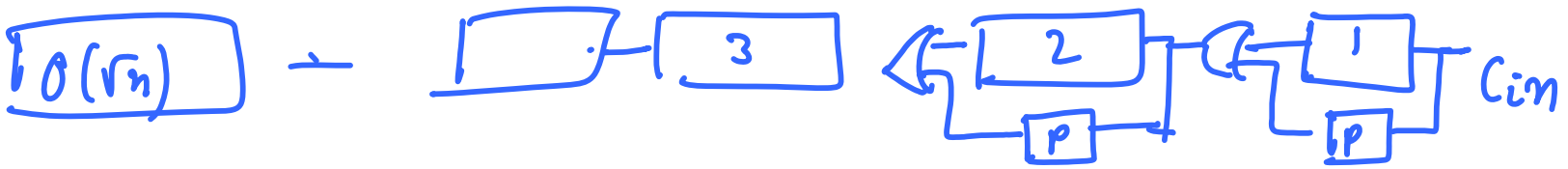
Total time : $O(\log(n))$

Question 6.

Only use Propagate

$g \equiv$ Cout of adding two blocks with $C_{in} = 0$

CARRY-SKIP ADDER



Stage I: Do the addition assuming $C_{in}=0$

$G + P.C_{in} = C_{out}$

Do additions in parallel.

$O(\sqrt{n})$

Output : All the generate functions

Stage II: For each block sequentially

compute : $C_{out} = G + PC_{in}$

$O(\sqrt{n})$

Output: The correct values of C_{in} for every block

Stage III : Add again with correct value of C_{in}.

$O(\sqrt{n})$

Final Complexity : $O(\sqrt{n})$

Next Class: Oct 10^{th}

Final Exam: Nov. End