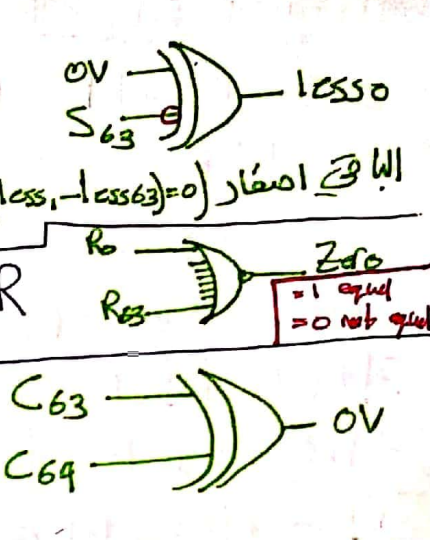
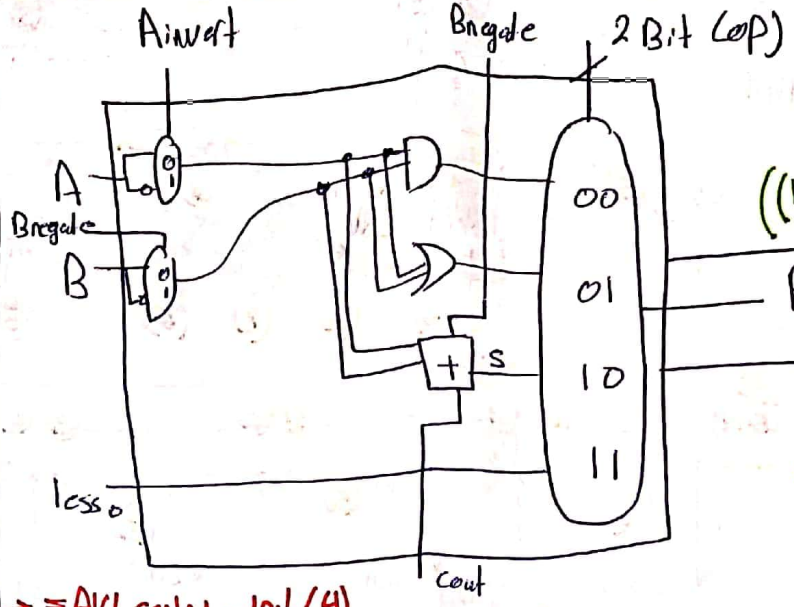
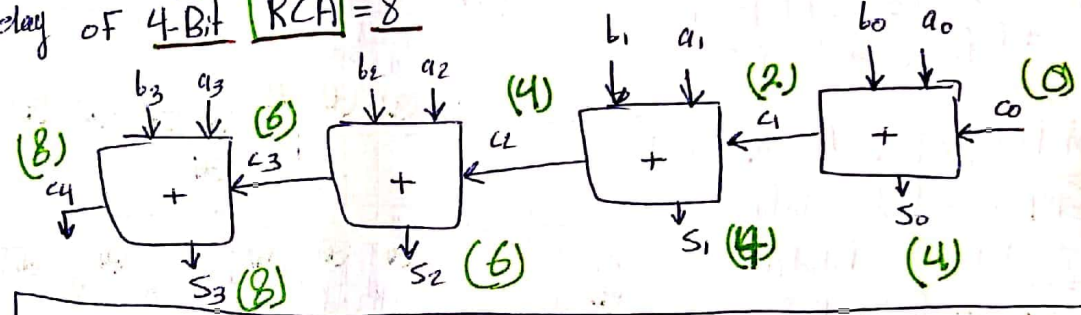


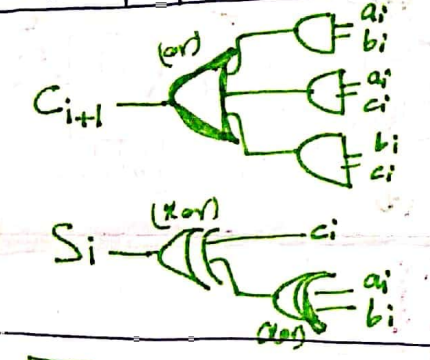
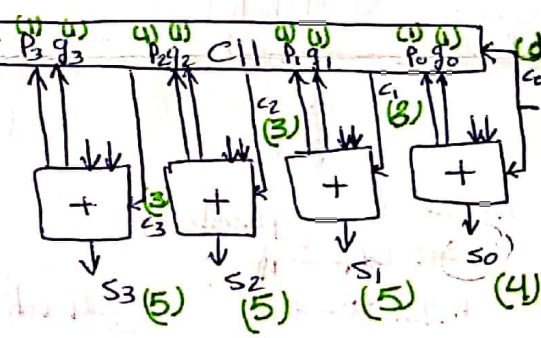
	Arigate	Bnigate	op
AND	0	0	00
OR	0	0	01
ADD	0	0	10
Sub/Bnch	0	1	10
Sll	0	1	11
NOR	1	1	00
NAUD	1	1	01



* Delay of 4-bit RCA = 8
 * Delay of 4-bit CLA = 5



$C_1 = g_0 + P_0 c_0$
 $C_2 = g_1 + P_1 g_0 + P_1 P_0 c_0$

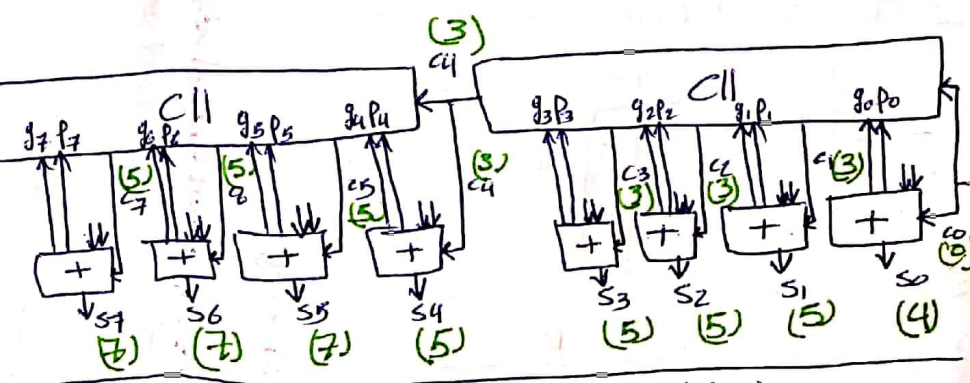


$C_3 = g_2 + P_2 g_1 + P_2 P_1 g_0 + P_2 P_1 P_0 c_0$
 $C_4 = g_3 + P_3 g_2 + P_3 P_2 g_1 + P_3 P_2 P_1 g_0 + P_3 P_2 P_1 P_0 c_0$

* Delay of 8-bit RCA = 16 → Simplex (max)

* Delay of 8-bit Hybrid = 7

$C_5 = g_4 + P_4 c_4$
 $C_6 = g_5 + P_5 g_4 + P_5 P_4 c_4$
 $C_7 = g_6 + P_6 g_5 + P_6 P_5 g_4 + P_6 P_5 P_4 c_4$
 $C_8 = g_7 + P_7 g_6 + P_7 P_6 g_5 + P_7 P_6 P_5 g_4 + P_7 P_6 P_5 P_4 c_4$



* Notes: * Delay of 4-bit CIA = 5
 * Delay of 16-bit CIA = 9
 * Delay of 64-bit CIA = 13
 * Delay of 256-bit CIA = 17

* Note: sd rs2, offset(rs1), ld rd, offset(rs1)
 * Note: ALU ops: add=00, sub=01, R-type=10
 * Note: $g_i = a_i \cdot b_i$, $P_i = a_i + b_i$
 $A \oplus B = \overline{A}B + A\overline{B}$

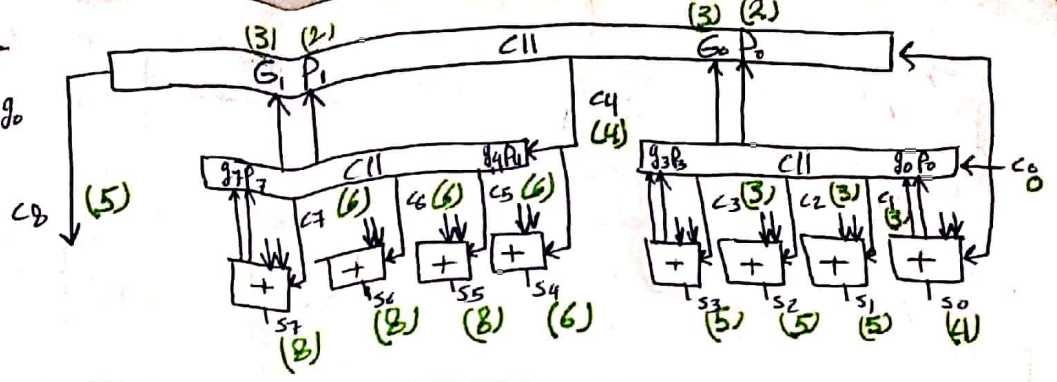
* Delay of 8-bit CIA = 8

$$G_0 = g_3 + P_3 g_2 + P_3 P_2 g_1 + P_3 P_2 P_1 g_0$$

$$P_0 = P_3 P_2 P_1 P_0$$

$$C_4 = G_0 + P_0 C_0$$

$$C_8 = G_1 + P_1 G_0 + P_1 P_0 C_0$$

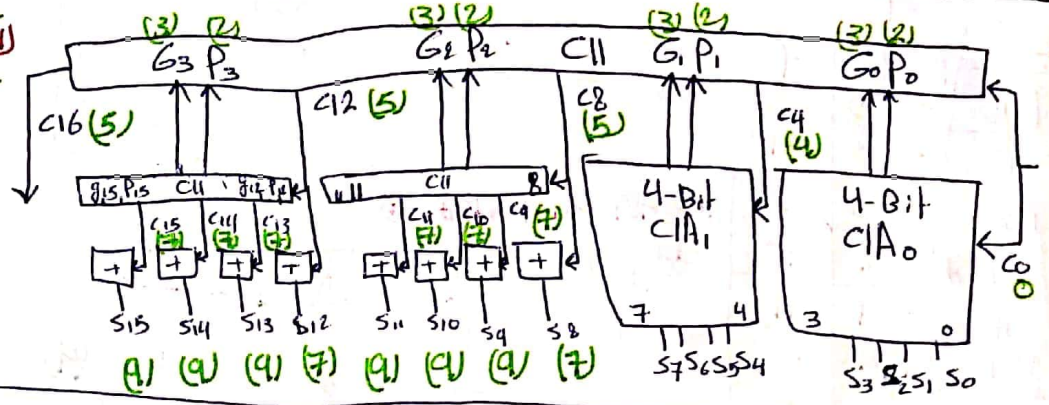


3 * Delay of 16-bit RCA = 32 (5+14)

* Delay of 16-bit CIA = 9

$$C_{12} = G_2 + P_2 G_1 + P_2 P_1 G_0 + P_2 P_1 P_0 C_0$$

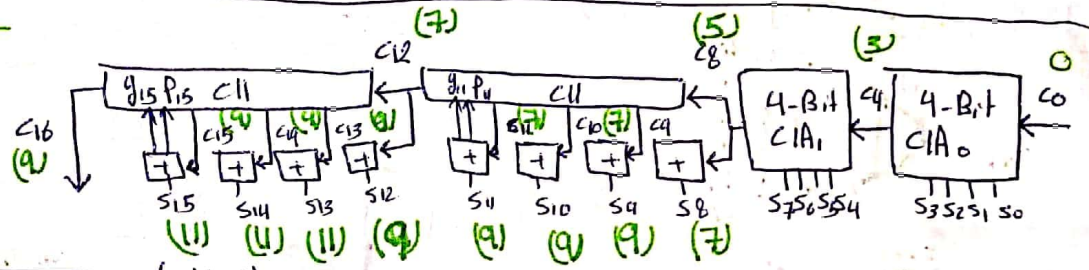
$$C_{16} = G_3 + P_3 G_2 + P_3 P_2 G_1 + P_3 P_2 P_1 G_0 + P_3 P_2 P_1 P_0 C_0$$



* Delay of 16-bit Hybrid = 11

$$C_{12} = g_{11} + P_{11} g_{10} + P_{11} P_{10} g_9 + P_{11} P_{10} P_9 g_8 + P_{11} P_{10} P_9 P_8 C_8$$

$$C_{16} = g_{15} + P_{15} g_{14} + P_{15} P_{14} g_{13} + P_{15} P_{14} P_{13} g_{12} + P_{15} P_{14} P_{13} P_{12} C_{12}$$

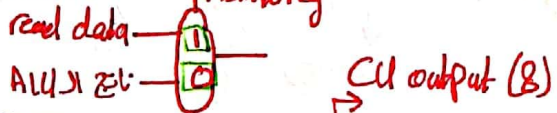


* Chy 8

- ① Fetch instruction
- ② decode (read reg)
- ③ ALU
- ④ read from (not sel) memory
- ⑤ PC ← Pch | Pch + 4 | Pch + 2x imm

5-steps

* Note:



	R-Format	MemRead	MemWrite	Branch	ALUOp1	ALUOp0
rdv	0	0	1	0	1	0
ldv	1	1	1	0	0	0
sd	1	0	0	0	0	0
beg	0	0	0	1	0	1

opcode [5:0] → CU input (7)

ALU Control → ALUop + 3 input from Func3 + Func7 (5)

