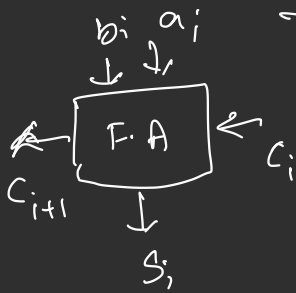


Carry look ahead adder:



we need to predict when will be

$$C_{i+1} = 1;$$

$$a_i + b_i + C_i = C_{i+1} + S_i$$

(Carry) (Sum)

a_i	b_i	C_i	C_{i+1}	S_i
0	0	0	0	0
0	0	1	0	1
0	1	0	0	1
0	1	1	1	0
1	0	0	0	1
1	0	1	1	0
1	1	0	1	0
1	1	1	1	1

→ $C_{i+1} = 1$, when $a_i = 1, b_i = 1$
 $= a_i b_i$

or

$$C_i = 1 \& a_i \oplus b_i$$

$$= C_i (a_i + b_i)$$

$$C_{i+1} = a_i b_i + C_i (a_i + b_i)$$

$$= g_i + C_i (P_i)$$

$g_i = a_i b_i$ (carry generator)

$$P_i = a_i \oplus b_i$$

(carry propagator)

$$S_i = a_i + b_i + C_i$$

$$= P_i + C_i$$

$$C_{i+1} = g_i + C_i P_i$$

4-bit carry look ahead adder

$a_3 \ a_2 \ a_1 \ a_0$
 $b_3 \ b_2 \ b_1 \ b_0$
 C_0

Step 1:- generate all carry generators & propagators

$$g_i = a_i b_i \quad p_i = a_i \oplus b_i$$

$$g_0 = a_0 b_0 \quad p_0 = a_0 \oplus b_0$$

$$g_1 = a_1 b_1 \quad p_1 = a_1 \oplus b_1$$

$$g_2 = a_2 b_2 \quad p_2 = a_2 \oplus b_2$$

$$g_3 = a_3 b_3 \quad p_3 = a_3 \oplus b_3$$

Step 2
Generate all carries (C₄N)

$$C_{i+1} = g_i + p_i C_i \quad C_2 = g_1 + p_1 C_1 \quad C_4 = g_3 + p_3 C_3$$

$$C_1 = g_0 + p_0 C_0 \quad C_3 = g_2 + p_2 C_2$$

Step 3: Generate all Sum.

