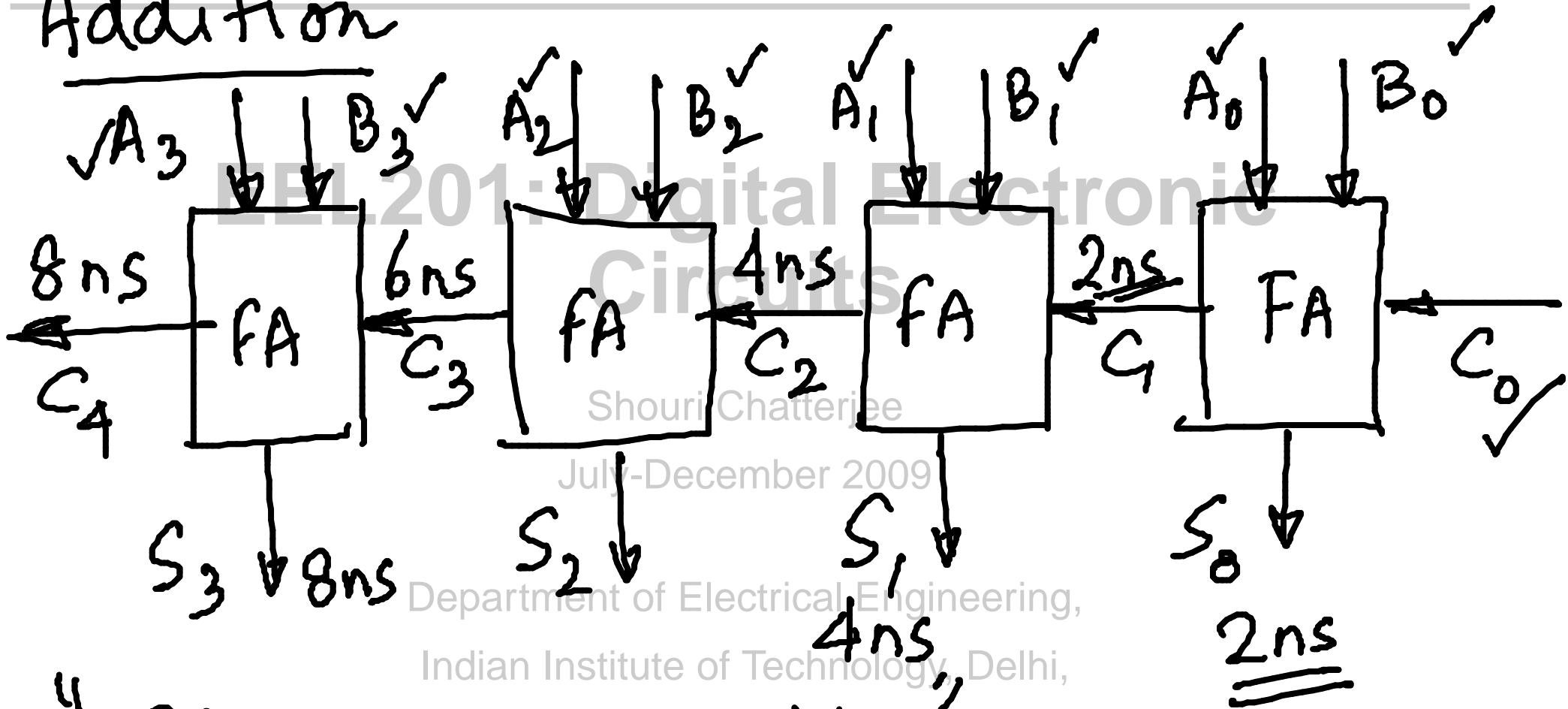


# Addition



"Ripple - carry adder"



All gates can have upto 4 inputs

AND  $\rightarrow$  1ns

OR  $\rightarrow$  1ns

XOR  $\rightarrow$  2ns

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64 bit addition  $\rightarrow$  128 nsec

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8 MHz!!

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# "Carry look-ahead"

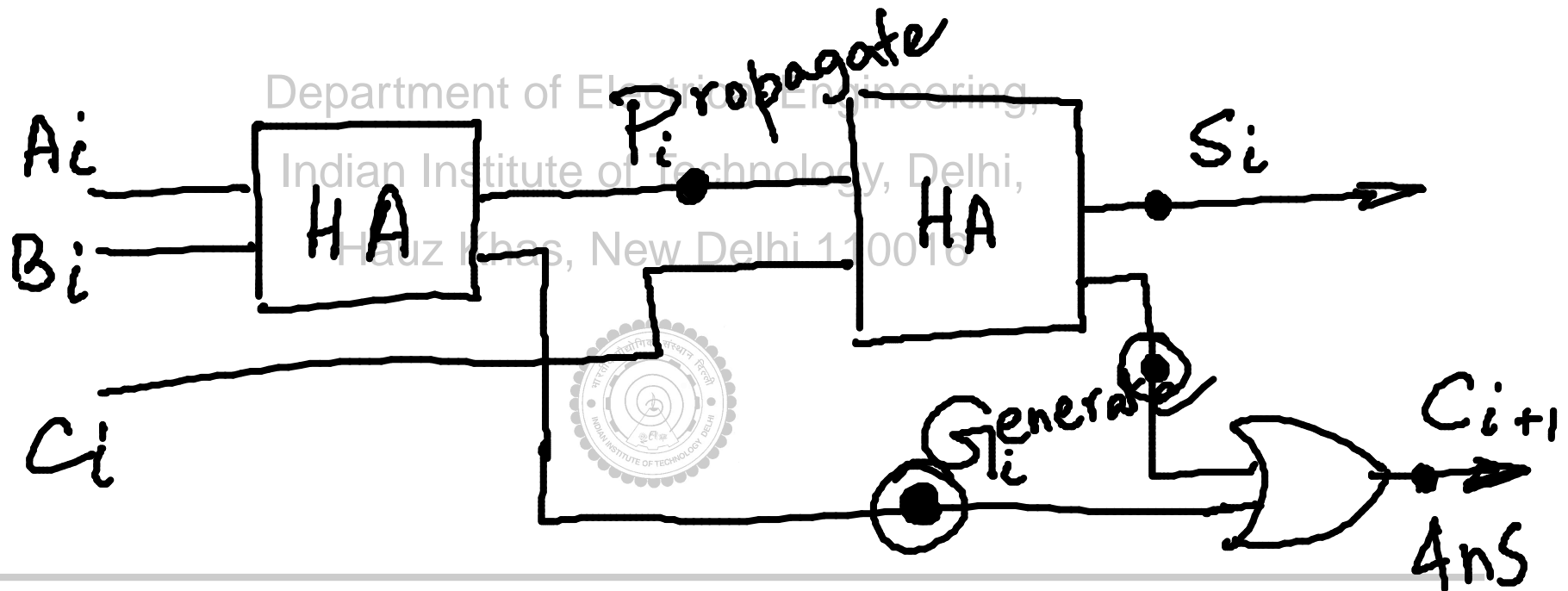
A	B	S	C
0	0	0	0
0	1	1	0
1	0	1	0
1	1	0	1

$$S = A \oplus B$$

$$C = AB$$

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$$S_i = P_i \oplus C_i$$

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

$$C_0$$

$$C_4 = G_3 + P_3 G_2 + P_3 P_2 G_1$$

$$C_1 = G_0 + P_0 C_0$$

$$+ P_3 P_2 P_1 G_0 + P_3 P_2 P_1 P_0 C_0$$

$$C_2 = G_1 + P_1 G_0 + P_1 P_0 C_0$$

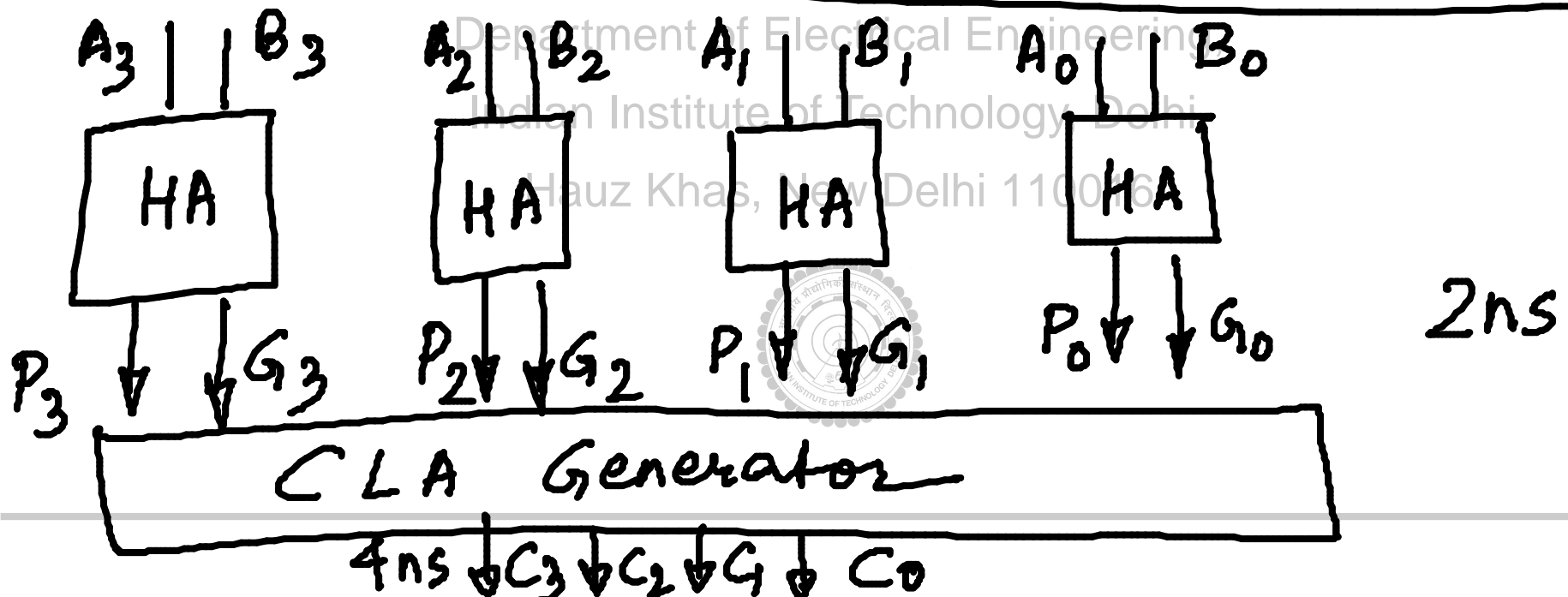
$G_I$

$P_I$

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$$C_3 = G_2 + P_2 G_1 + P_2 P_1 G_0 + P_2 P_1 P_0 C_0$$

$$C_4 = G_I + P_I C_0$$



$$C_4 = G_I + P_I C_0$$

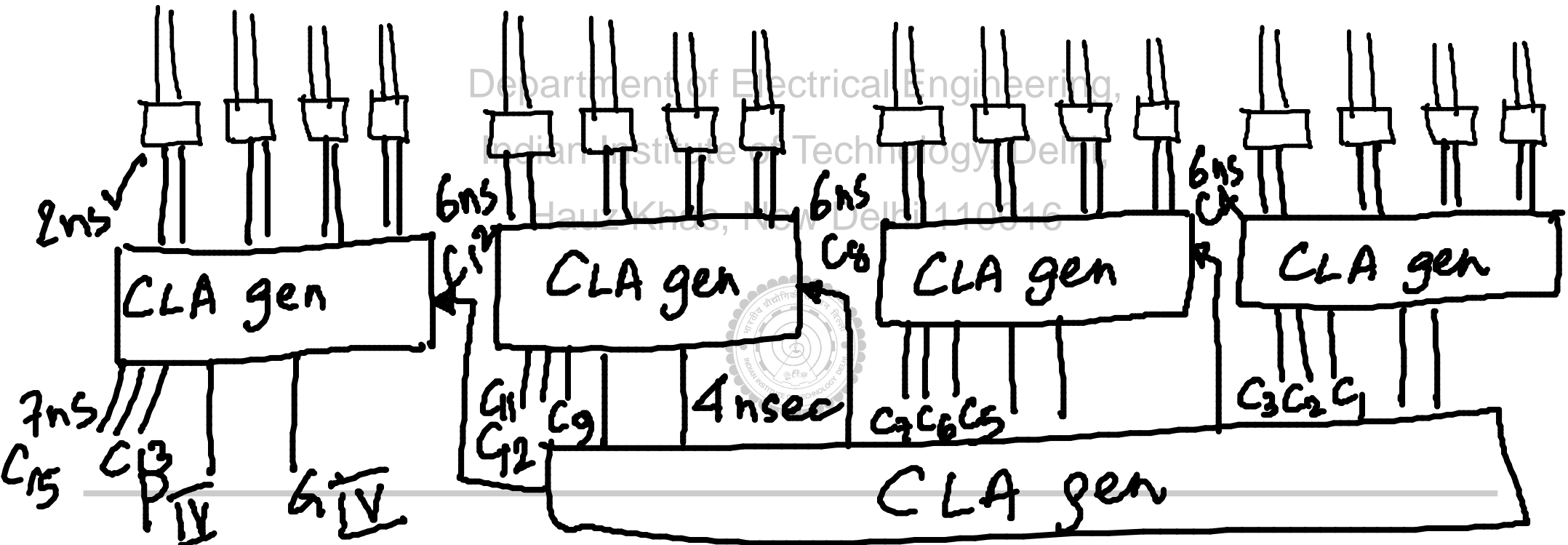
$$C_8 = G_{II} + P_{II} G_I + P_{II} P_I C_0$$

$$C_{12} = G_{III} + P_{III} G_{II} + P_{III} P_{II} G_I + P_{III} P_{II} P_I C_0$$

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