CSMSIA F14 MDE

GENERALIZATION OF g_i, p_i AND c_i SIGNALS
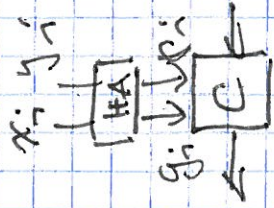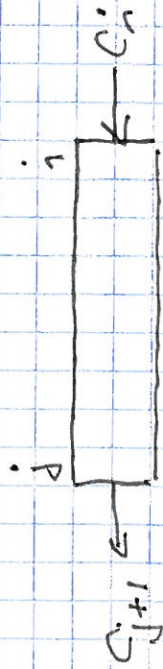
$g_i = x_i y_i$ $g_i = 1$ IF $x_i + y_i = 2$ $g_i = 0$ OTHERWISE

$p_i = x_i \oplus y_i$ $p_i = 1$ IF $x_i + y_i = 1$ $p_i = 0$ OTHERWISE

$c_{i+1} = g_i + p_i c_i$

CONSIDER A GROUP IN AN ADDER BETWEEN POSITIONS i AND j

2 POSSIBLE CASES:

(a)

GROUP PROPAGATES IN ALL POSITIONS

$P = p_i p_{i-1} ... p_{j+1} p_j$ $p_k = 1, \forall k \,|\, i \geq k \geq j \implies c_{j+1} = c_i$

$c_{j+1} = P c_i$

(b)

GROUP GENERATES c_{j+1} INDEPENDENT OF c_i

$G = g_j + p_j g_{j-1} + p_j p_{j-1} g_{j-2} ... + p_j p_{j-1} ... p_{i+1} g_i$
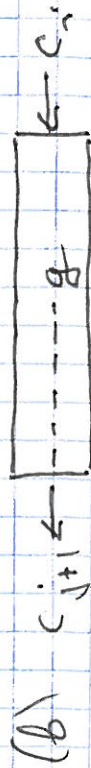
$c_{j+1} = G$

COMBINE (a) AND (b):

$c_{j+1} = G + P c_i$

$c_{j+1} = G + P c_i$

— APPLIES TO ANY GROUP SIZE

(a) 110001
     001110
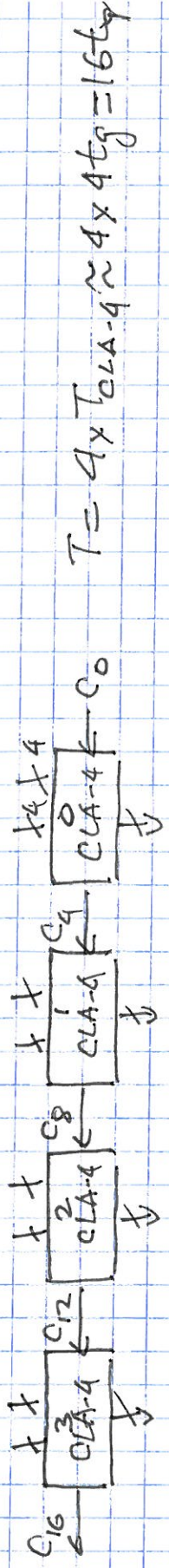   rrrrrr ALL $p_k = 1$

(b) 011100
     100111
     pppppp

SINGLE-LEVEL CARRY-LOOKAHEAD ADDER!

$$T = 4 \times T_{CLA-4} \approx 4 \times 4t_g = 16t_g$$

STILL DELAY $O(n)$. CAN WE DO BETTER?

<u>YES</u>

$$\left. \begin{array}{l} G - \text{GROUP GENERATE} \\ P - \text{"} \quad \text{PROPAGATI} \end{array} \right.$$

$$C_8 ? \qquad C_8 = G_1 + P_1 G_0 + P_1 P_0 C_0$$

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

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

— CORRESPOND TO CLG-4!