

Look carry ahead circuit

$$\text{Sum} \Rightarrow A \oplus B \oplus C_{in}$$

$$\text{Carry} \Rightarrow C_{in}(A+B) + AB$$

$$P \Rightarrow A \oplus B$$

$$G \Rightarrow A \cdot B$$

eq ① :-

$$C_n P_0 + G_0$$

eq ② :-

$$\checkmark C_n P_0 P_1 + G_0 P_1 + G_1$$

eq ③ :-

$$C_n P_0 P_1 P_2 + G_0 P_1 P_2 + G_1 P_2 + G_2$$

eq ④ :-

$$C_n P_0 P_1 P_2 P_3 + G_0 P_1 P_2 P_3 + G_1 P_2 P_3 + G_2 P_3 + G_3$$