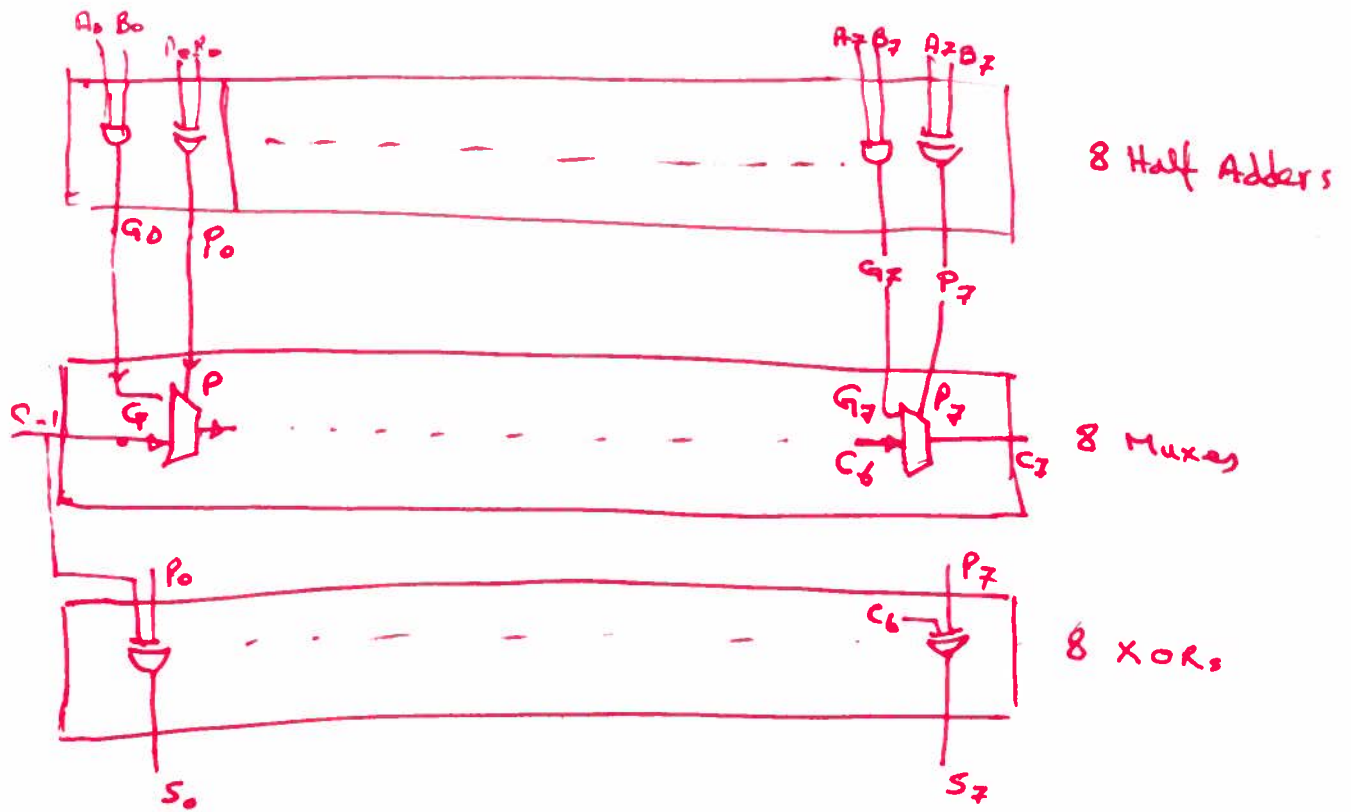


Q1



Total Area  $8 (3A_G + A_M) = 24A_G + 8A_M$

Total Delay  $1D_G + 8D_M + 1D_G = 2D_G + 8D_M$

Frequency =  $\frac{1}{2D_G + 8D_M}$

Q2

2's Complement of 5

$$\overbrace{0101}^5 \rightarrow \overbrace{11011}^{-5}$$

Using Booth Method

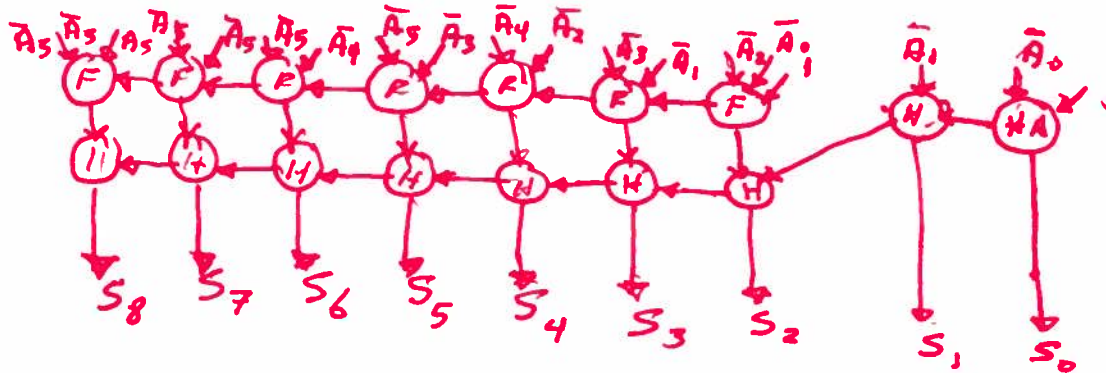
$$\begin{array}{r} \overbrace{110110}^{-1} \\ \underbrace{0} \quad \underbrace{110}^{-1} \\ \hline \end{array} \text{ addition}$$

Therefore Multiplier is  $-1, -1, 0$

$$\begin{array}{cccccccc} \bar{A}_5 & \bar{A}_5 & \bar{A}_5 & \bar{A}_5 & \bar{A}_4 & \bar{A}_3 & \bar{A}_2 & \bar{A}_1 & \bar{A}_0 \\ \bar{A}_5 & \bar{A}_5 & \bar{A}_4 & \bar{A}_3 & \bar{A}_2 & \bar{A}_1 & \bar{A}_0 & 0 & 1 \\ \hline & & & & & & & & 1 \\ S_8 & S_7 & S_6 & S_5 & S_4 & S_3 & S_2 & S_1 & S_0 \end{array}$$

Generate complement of A

$$\begin{array}{cccccc} A_5 & A_4 & A_3 & A_2 & A_1 & A_0 \\ \downarrow & \downarrow & \downarrow & \downarrow & \downarrow & \downarrow \\ \bar{A}_5 & \bar{A}_4 & \bar{A}_3 & \bar{A}_2 & \bar{A}_1 & \bar{A}_0 \end{array}$$



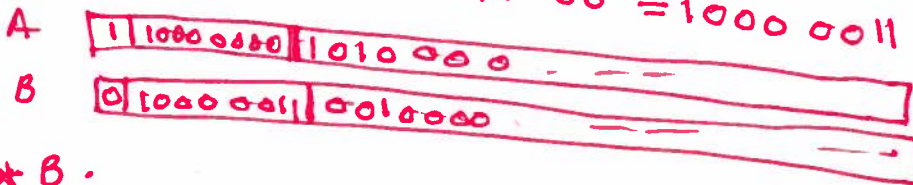
Delay = 7 D<sub>FA</sub> + 1 D<sub>HA</sub>

Area = 7 A<sub>FA</sub> + 9 A<sub>HA</sub> + 6 inv

Q3

$$\begin{cases} A = -3.25 = -11.01 = 1.101 \times 2^1 \\ \text{exp}_A = 1 + 127 = 128 = 0111\ 1111 + 1 = 1000\ 0000 \end{cases}$$

$$\begin{cases} B = 18.0 = 010010.0 = 1.0010 \times 2^4 \\ \text{exp}_B = 4 + 127 = 131 = 0111\ 1111 + 100 = 1000\ 0011 \end{cases}$$



A \* B :

XOR right bit  $1 \oplus 0 = 1$ ;

Add exponents  $\text{exp}_R = \text{exp}_A + \text{exp}_B = 1000 + 1000\ 0011 = 0111\ 1111 = 1000\ 01$

Multiply significant

$$\begin{array}{r} 1.101 \\ \times 1.001 \\ \hline 1101 \\ 1101 \\ \hline 1.110101 \end{array}$$

Result



Rounding: When  $R(M_0 + 5)$  is true, then  $\text{significant} = \text{significant} + 0.01$

In table format this is

$x0.00 \rightarrow x0.$	$x1.00 \rightarrow x1.0$
$x0.01 \rightarrow x0$	$x1.01 \rightarrow x1.0$
$x0.10 \rightarrow x0$	$x1.10 \rightarrow x1 + 1$
$x0.11 \rightarrow x1$	$x1.11 \rightarrow x1 + 1$

