hw6 唐嘉良 2020K8009907032

11.011100
00.101000

100100
011011

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6.27 (1) 设 $x = 2^5 \times \frac{11}{16}$，$y = 2^4 \times (-\frac{9}{16})$

$[x]_补 = 00,101;00.101100$，$[y]_补 = 00,100;11,\cancel{1001}$ 011100

① 对阶 $[\Delta j]_补 = [j_x]_补 + [-j_y]_补 = 00,101 + 11,100 = 00,001$

阶差为1 $\therefore S_y \to 1$，$j_y + 1$ $\therefore [y]_补 = 00,101;11.101110$

② 尾数求和 $[S_x]_补 + [S_y]_补 = 00.101100 + 11.101110 = 00.011010$

③ 左规 $[x+y]_补 = 00,101;00.01100$

$\Rightarrow [x+y]_补 = 00,100;00.11000$

$\therefore x+y = 2^4 \times (0.110100) = 2^4 \times \frac{13}{16}$

(2) 设 $x = 2^{-3} \times \frac{13}{16}$，$y = 2^{-4} \times (-\frac{5}{8})$

$[x]_补 = 11,101;00.110100$ $[y]_补 = 11,100;11.011000$

① 对阶：$[\Delta j]_补 = [j_x]_补 + [-j_y]_补 = 11,101 + 00,100 = 00,001$

阶差为1 $\therefore S_y \to 1$，$j_y + 1$ $\therefore [y]_补 = 11,101;11.101100$

② 尾数求和 $[S_x]_补 - [S_y]_补 = 00.110100 + 00.010100 = 01.001000$

③ 右规 $[x-y]_补 = 11,101;01.001000$

右规后 $[x-y]_补 = 11,110;00.100100$

$\therefore x-y = 2^{-2} \times \frac{9}{16}$

(3) 设 $x = 2^3 \times \frac{13}{16}$，$y = 2^4 \times (-\frac{9}{16})$

$[x]_补 = 00,011;00.110100$　$[y]_补 = 00,100;11,011100$

① 阶码相加 $[j_x + j_y]_补 = [j_x]_补 + [j_y]_补 = 00,011$

$$\begin{array}{r} 00,011 \\ +00,100 \\ \hline 00,111 \end{array}$$

② 尾数相乘 (补码两位乘)

部分积	乘数	y_{i+1}	
000.000000	11.011100	0	
000.000000	00110111	0	→2
+111.001100			+[x]补
111.001100			
	00001101	1	→2
+001.101000			+[x]补
001.011011			
000.010110	11 0000 11	0	→2
+111.001100			+[-x]补
111.100010	110000		

$[S_x \cdot S_y]_补 = 11.1000101 10000$

③ 左规　$[x \cdot y]_补 = 00,110;11.000101(100000)$

$\therefore x \cdot y = 2^6 \times (-0.111011) = 2^6 \times (-\frac{59}{64})$

同 1 移减
异 0 移加.

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(4) 设 $x=2^6\times(-\frac{11}{16})$，$y=2^3\times(-\frac{15}{16})$

$[x]_补 = 00,110;11.010100$　　$[y]_补 = 00,011;11.000100$

①阶码相减 $[j_x-j_y]_补=[j_x]_补+[-j_y]_补=$

$$\begin{array}{r} 00,110 \\ +\ 11,101 \\ \hline 00,011 \end{array}$$

②尾数相除（补码加减交替法）

1.010100	0.000000	
+0.111100		同号作减法
0.010000	0	~~异号~~上0.
0.100000	0	←1
+1.000100		+[y]补
1.100100	01	上1
1.001000	01	←1
+0.111100		+[-y]补
0.000100	010	上0
0.001000	010	←1
+1.000100		+[y]补
1.001100	0101	上1
0.011000	0101	←1
+0.111100		+[-y]补
1.010100	01011	上1
0.101000	01011	←1
+0.111100		+[-y]补
1.100100	010111	上1
1.001000	010111	←1
1.001000	0101111	置1

$\Rightarrow [S_x\cdot S_y]_补 = 0.101111$　　已规格化.

③ $\therefore x\div y = 2^3\times 0.101111 = 2^3\times\frac{47}{64}$

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(5) 设 $x = 2^3 \times (-1)$, $y = 2^{-2} \times \frac{57}{64}$

$[x]_补 = 00,011;11.000000$ $[y]_补 = 11,110;00.111001$

①阶码相加 $[j_x + j_y]_补 = 00,011 + 11,110 = 00,001$

②尾数相乘(补码两位乘)

部分积	乘数	y_{i+1}	说明
000.000000	00.111001	0	
+111.000000			+[x]补
111.000000			
111.110000	00.001110	0	→2
+010.000000			+2[-x]补
001.110000			
000.011100	00.000011	1	→2
000.000111	00.000000	1	→2
+111.000000			+[x]补
111.000111	000000		

~~已经规格化.~~

$[S_x \cdot S_y]_补 = 11.000111000000$

$\therefore [x \cdot y] = 2^1 \times (-0.111001)$

$= 2 \times (-\frac{57}{64})$

(6) 设 $x = 2^{-6} \times (-1)$, $y = 2^{7} \times (-\frac{1}{2})$

$[x]_补 = 11,010; 11.000000$ $[y]_补 = 00,111; 11.100000$

①阶码相减 $[j_x - j_y]_补 = 11,010$

$$\begin{array}{r} 11,010 \\ +\ 11,001 \\ \hline 110,011 \end{array}$$

溢出

②尾数相除（补码加减交替法）

1.000000 +0.100000	0.000000	同号做减法
1.[redacted]100000	[redacted]	上[redacted]，溢出（够减）

[redacted] 结果溢出!

(7) 设 $x=3.3125=2^2\times\frac{53}{64}$, $y=6.125=2^3\times\frac{49}{64}$

$[x]_补=00,010;00.110101$　　$[y]_补=00,011;00.110001$

① 对阶　$[\Delta j]_补=00,010$

$$\begin{array}{r} 00,010 \\ +\ 11,101 \\ \hline 11,111 \end{array}$$

阶差−1，则 $S_x\rightarrow1$，j_x+1

$\Rightarrow[x]_补=00,011;00.011010$

② 尾数求和　$[S_x+S_y]_补=00,110101$

$$\begin{array}{r} 00,110101 \\ +\ 00,110001 \\ \hline 01,001011 \end{array}$$

③ 右规　右规后 $[x+y]_补=00,100;00,100101$

$\therefore x+y=2^4\times\frac{37}{64}=\frac{37}{4}=9.25$

(8) 设 $x=14.75$, $y=2.4375$

$[x]_补=00,100;00.111011$　　$[y]_补=00,010;00.100111$

① 对阶　$[\Delta j]_补=00,100$

$$\begin{array}{r} 00,100 \\ +\ 11,110 \\ \hline 00,010 \end{array}$$

阶差2，则 $S_y\rightarrow2$，j_y+2

$\Rightarrow[y]_补=00,100;00,001001$

② 尾数求和　$[S_x-S_y]_补=00.111011$

$$\begin{array}{r} 00.111011 \\ +\ 11.110111 \\ \hline 00.110010 \end{array}$$

已经规格化

$\therefore x-y=2^4\times\frac{25}{32}=\frac{25}{2}=12.5$

ty=30ns.

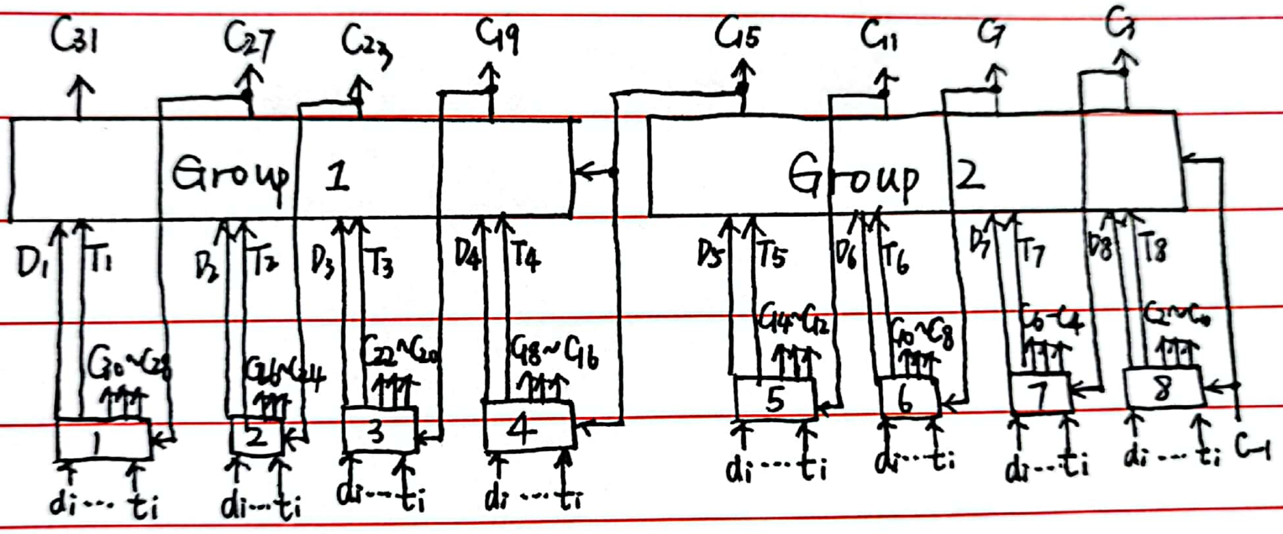
6.31 ① 若用并行加法器串行进位链，则 $t_总 = 2\times32\times30ns = 1.92\mu s > 0.6\mu s$. 不符合

② 若并行加法器用单重分组跳跃进位，每组4位Ci，则 $t_总 = 2.5ty \times (32\div4) = 0.6\mu s$ 恰符合

③ 若并行加法器用双重分组跳跃进位，每小组4位Ci，每大组4个小组，则 $t_总 = 10ty = 0.3\mu s < 0.6\mu s$ 符合.

下面采用③：

进位链：



加法器逻辑框图：