28.

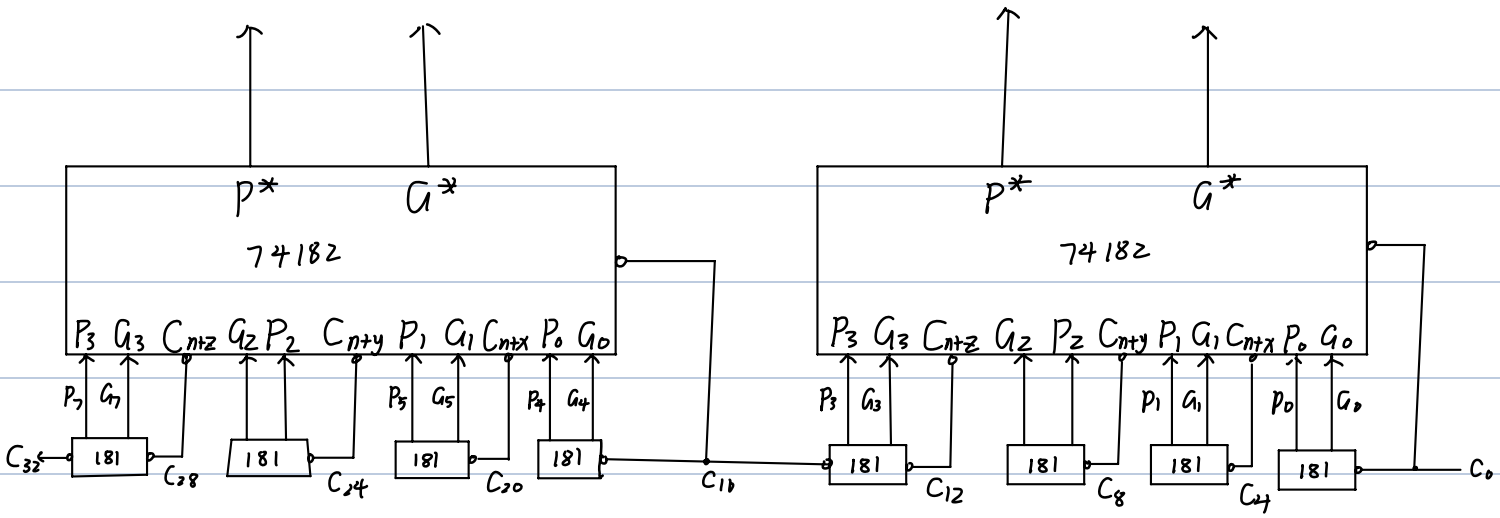
(1) $g_i = a_i b_i$; $p_i = a_i \oplus b_i$, $i = 0, 1, \cdots 31$

(2) $C_4 = g_3 + p_3 g_2 + p_3 p_2 g_1 + p_3 p_2 p_1 g_0 + p_3 p_2 p_1 p_0 C_0$

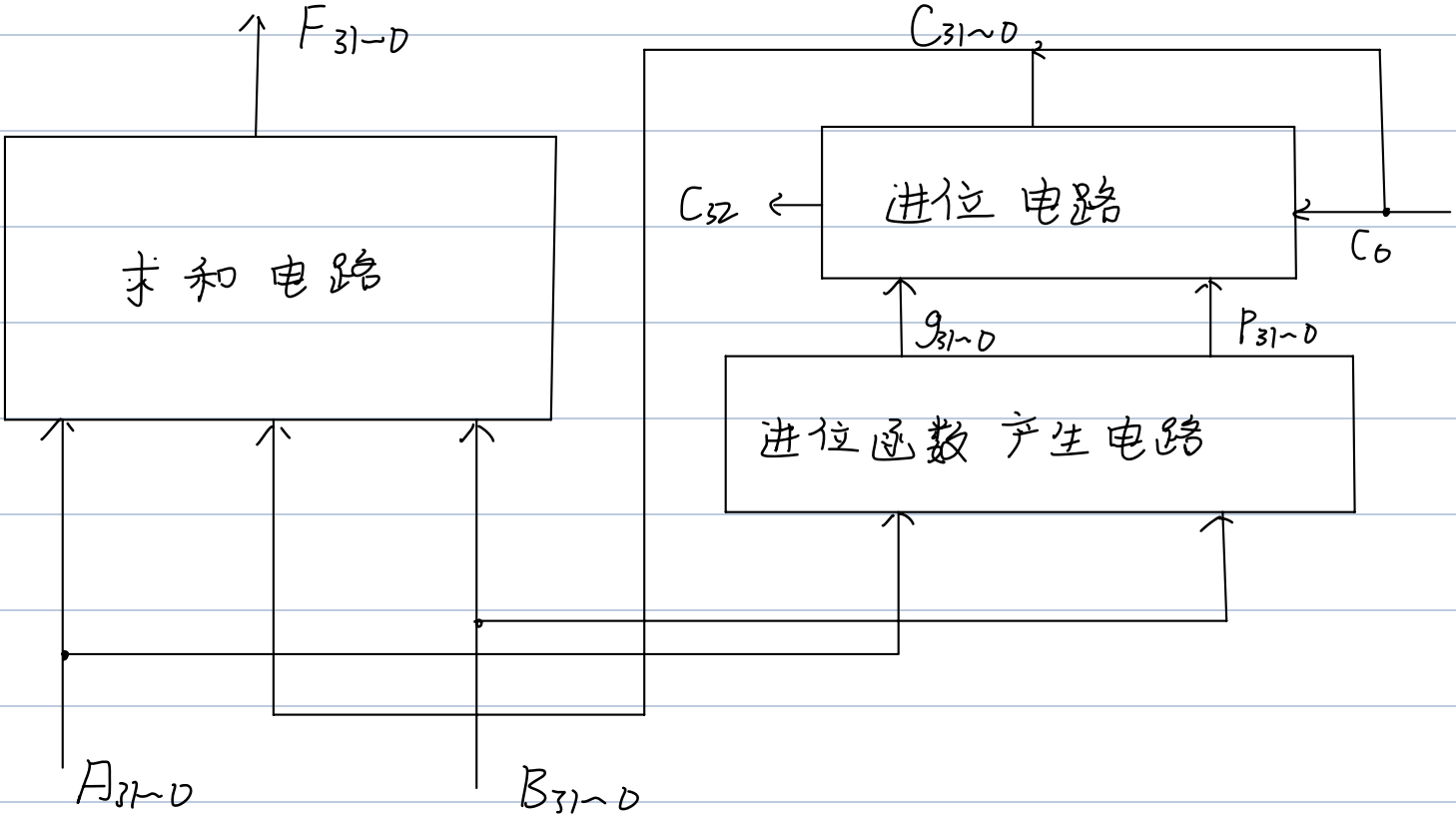
$G_0 = g_3 + p_3 g_2 + p_3 p_2 g_1 + p_3 p_2 p_1 g_0$;

$P_0 = p_3 p_2 p_1 p_0$

(3)



32位加法器框图如下，进位电路如上图



29.

(1)

阶符	阶码	数符	尾数
1	5	1	9

最小负数：0，11111；1.111111111

是大正数：0，11111；0.111111111

范围：$-2^{31}\times(1-2^{-9})\sim 2^{31}\times(1-2^{-9})$

(2)

最小正数 = 0，00000；0.100000 000

最大正数 = 1，11111；0.111 111 111

正数真值范围：

$$2^{-32}\times 2^{-1}\sim 2^{31}\times(1-2^{-9})$$

最小负数 = 1，11111；1.000 000 000

最大负数 = 0，00000；1.011 111 111

对应的负数真值范围

$$2^{31}\times(-1)\sim -2^{-32}\times(2^{-1}+2^{-9})$$

(3) $-27/1024 = 2^{-5}\times(-0.11011)_2$

$7.375=(111.011)_2=2^3\times(0.111011)_2$

-27/1024的阶尾补规格化数 = 0，11011；1.001 010 000

7.375的阶尾补规格化数 = 1，00011；0.1110 11000

33.

(1) $[X]_{补} = 1,101;\ 0.101100$

$[Y]_{补} = 1,110;\ 1.100100$

① 对阶

$[\Delta E_{补}] = [E_X]_{补} + [-E_Y]_{补} = 11,101 + 00,010 = 11111 < 0$

E_X向E_Y对齐

$[E_X]_{补+1} = 11,101 + 00,001 = 11,110$

$[\Delta E]_{补+1} = 11,111 + 00,001 = 00,000 = 0$

$[X]_{补} = 1,110;\ 0,010\ 110(0)$

② 尾数相加减

$$
\begin{array}{rl}
[M_X]_{补} + [M_Y]_{补} = & 00.010\,110\,(0) \\
& +\ 11.100100 \\
\hline
& 11.111010\,(0)
\end{array}
$$

$$
\begin{array}{rl}
[M_X]_{补} + [-M_Y]_{补} = & 00.010\,110\,(0) \\
& +\ 00.011100 \\
\hline
& 00.110010\,(0)
\end{array}
$$

③ 结果规格化

$[X+Y]_{补} = 11,110;\ 11.111010\,(0)$

$= 11.011;\ 11.010000$

$[X-Y]_{补} = 11,110;\ 00.110010\,(0)$

④ 舍入：舍

⑤ 溢出：无

$X+Y = 2^{-101} \times (-0.110000)$

$$X-Y = 2^{-010} \times 0.110010$$

(2)

$[X]_{补} = 0,101;1.011011$

$[Y]_{补} = 0,100;1,110001$

011

100

① 对阶

$[\Delta E]_{补} = [E_X]_{补} + [-E_Y]_{补} = 0101 + 1100 = 0001 > 0$

$[E_Y]_{补} + 1 = 00.100 + 00.001 = 00.101$

$[\Delta E]_{补} + [-1]_{补} = 00,000$

结束

$[Y]_{补} = 0,101;1,111000(1)$

② 尾数运算：

$$\begin{array}{r} [M_x]_{补} + [M_y]_{补} = \quad 11,011011 \\ + \quad 11,111000(1) \\ \hline 11,010011(1) \end{array}$$

$$\begin{array}{r} [M_x]_{补} + [-M_y]_{补} = \quad 11,011011 \\ + \quad 00,000111(1) \\ \hline 11.100010(1) \end{array}$$

③ 结果规格化

$[X+Y]_{补} = 00,101;11.010011(1)$

$[X-Y]_{补} = 00,100;11.000101$

④ 舍入

$[X+Y]_{补} = 00,101 : 11,010\ 011$ (舍)

$[X-Y]_{补} = 00,100 ; 11,000\ 101$ (不变)

⑤ 溢出无

$X+Y = 2^{101} \times (0.101101)$

$X-Y = 2^{100} \times (-0.111011)$

34.

(1) $[X]_{阶格尾原} = 1,100 ; 0.100111$

$[Y]_{阶格尾原} = 1,011 ; 1.101011$

① 阶码相加减

$[E_X]_{移} + [E_Y]_{补} = 01,100 + 00,011 = 01,111$

$[E_X]_{移} + [E_Y]_{补} = 01,100 + 11,101 = 01,001$

② 尾数相乘除

$[M_X]_{原} = 0.100111 \quad [M_Y]_{原} = 1.101011$

$M_{X_0} = 0 \quad M_{y_0} = 1$

$M_{P_0} = M_{X_0} \oplus M_{y_0} = 0 \oplus 1 = 1$

部分积	乘数 Y^*	
0.000000	.101011	$\longrightarrow +X^*$
+ 0.100111		
0.100111		
→ 10.010011	1.10101	$\longrightarrow +X^*$
+ 0.100111		

0.111010

→| 0.011101　01.1010 ——→ +0

→| 0.001110　101.101 ——→ +X*

+ 0.100111

0.111010

→| 0.011010　1101.10 ——→ +0

→| 0.001101　0110.1 ——→ +X*

+ 0.100111

0.110100

→| 0.011010　001101.

$[M_x \times M_y]_{原} = 1.011010\ 001101$

$P_{浮} = [X \times Y]_{阶码原} = 01,111;1.011010\ 001101$

相除：

$[-M_y^*]_{补} = 1.010101$

$M_y^* = 0.101011$

被除数	商	
00.100111	0.000000	
+11.010101		试减 $+[-M_y^*]_{补}$
11.111100	r<0，商0	
|← 11.111000	0.	
+00.101011	$+M_y^*$	
00.100011	r>0，商1	
|← 01.000110	0.1	

+ 11.010101	$+[-M_y^*]_{补}$
00.011011	$r>0$，商1
1← 00.110110	0.11
+ 11.010101	$+[-M_y^*]_{补}$
00.001011	$r>0$，商1
1← 00.010110	0.111
+ 11.010101	$+[-M_y^*]_{补}$
11.101011	$r<0$，商0
1← 11.010110	0.1110
+ 00.101011	$+M_y^*$
00.000001	$r>0$，商1
1← 00.000010	0.11101
+ 11.010101	$+[-M_y^*]_{补}$
11.010111	$r<0$ 商0
	0.111010
+ 00.101011	$+M_y^*$
00.000010	

$M^*\div Y^* = 0.111010$　　$[M\div Y]_{原} = 1.111010$

$r^* = 0.000010 \times 2^{-6} = 0.000\,000\,000\,010$

$[Q]_{补} = [X\div Y]_{阶移尾原} = 01,001;1.111010$

③ 结果规格化：

$[X\times Y]_{阶移尾补} = 01,111;1.011010\,001\,101$

$= 01,110;1.101000\,10$　　(左规1位)

$[X\div Y]_{阶移尾补} = 01,001;1.111010$

④ 舍入：

$[P]_{浮}=[X\times Y]_{阶移尾外}=01,110;1.110100$（舍去）

$[Q]_{浮}=[X\div Y]_{阶移尾外}=01,001;1.111010$

⑤ 溢出（无）

$X\times Y=2^{110}\times(-0.110100)$

$X\div Y=2^{001}\times(-0.111010)$

(2)

$[X]_{阶移尾原}=1,101;1.101101$

$[Y]_{阶移尾原}=1,001;1.111000$

① 阶码相加减

$[E_X]_{移}+[E_Y]_{补}=01101+00001=01110$（无溢出）

$[E_X]_{移}+[-E_Y]_{补}=01101+11111=01100$（无溢出）

② 尾数相乘除

$M_{X0}=1 \quad M_{Y0}=1 \quad M_{X0}\oplus M_{Y0}=1\oplus 1=0$

部分积	乘数 Y^*
0.000000	0.111100 ⟶ +0
→ 0.000000	00.11110 ⟶ +0
→ 0.000000	000.1111 ⟶ $+X^*$
+ 0.101101	
0.101101	
→ 0.010110	1000.111 ⟶ $+X^*$
+ 0.101101	

1001
11111

1.000011

→| 0.100001 　　1100 0.11 ⟶ $+x^*$

\+ 0.101101

1.001110

→| 0.100111 　　0110 00.1 ⟶ $+x^*$

\+ 0.101101

1.010100

→| 0.101010 　　0011000.

$M_x^* \times M_y^* = 0.101010\ 001100$

$[M_x \times M_y]_{原} = 0.101010\ 001100$

$[P]_{补} = [X \times Y]_{阶移尾原} = 01,110;\ 0.101010\ 001100$

相除：

$[-M_y^*]_{补} = 1.000100$

被除数	商
00.101101	0.000000
\+ 11.000100	试减，$+[-M_y^*]_{补}$
11.110001	$r<0$，商0
|← 11.100010	0.
\+ 00.111100	$+M_y^*$
00.011110	$r>0$，商1
|← 00.111100	0.1
\+ 11.000100	$+[-M_y^*]_{补}$
00.000000	$r>0$，商1
|← 00.000000	0.11
\+ 11.000100	$+[-M_y^*]_{补}$

11. 000100	r<0, 商0
←10. 001000	0.110
+00. 111100	+My*
11. 000100	r<0, 商0
←10. 001000	0.1100
+00. 111100	+My*
11. 000100	r<0, 商0
←10. 001000	0.11000
+00. 111100	+My*
11. 000100	r<0, 商0
+00. 111100	0.110000
00. 000000	

$M_X^* \div M_Y^* = 0.110000$

$r^* = 0.000000 \times 2^{-6} = 0.000000000000$

$[Q]_{补} = 01,100; 0.110000$

③ 结果规格化

都是规格化

④ $[X \times Y]_{阶码原} = 01,110; 0.101010$ (舍去)

$[X \div Y]_{阶码原} = 01,100; 0.110000$ (不变)

⑤ 无溢出

$X \times Y = 2^{110} \times 0.101010$

$X \div Y = 2^{100} \times 0.110000$