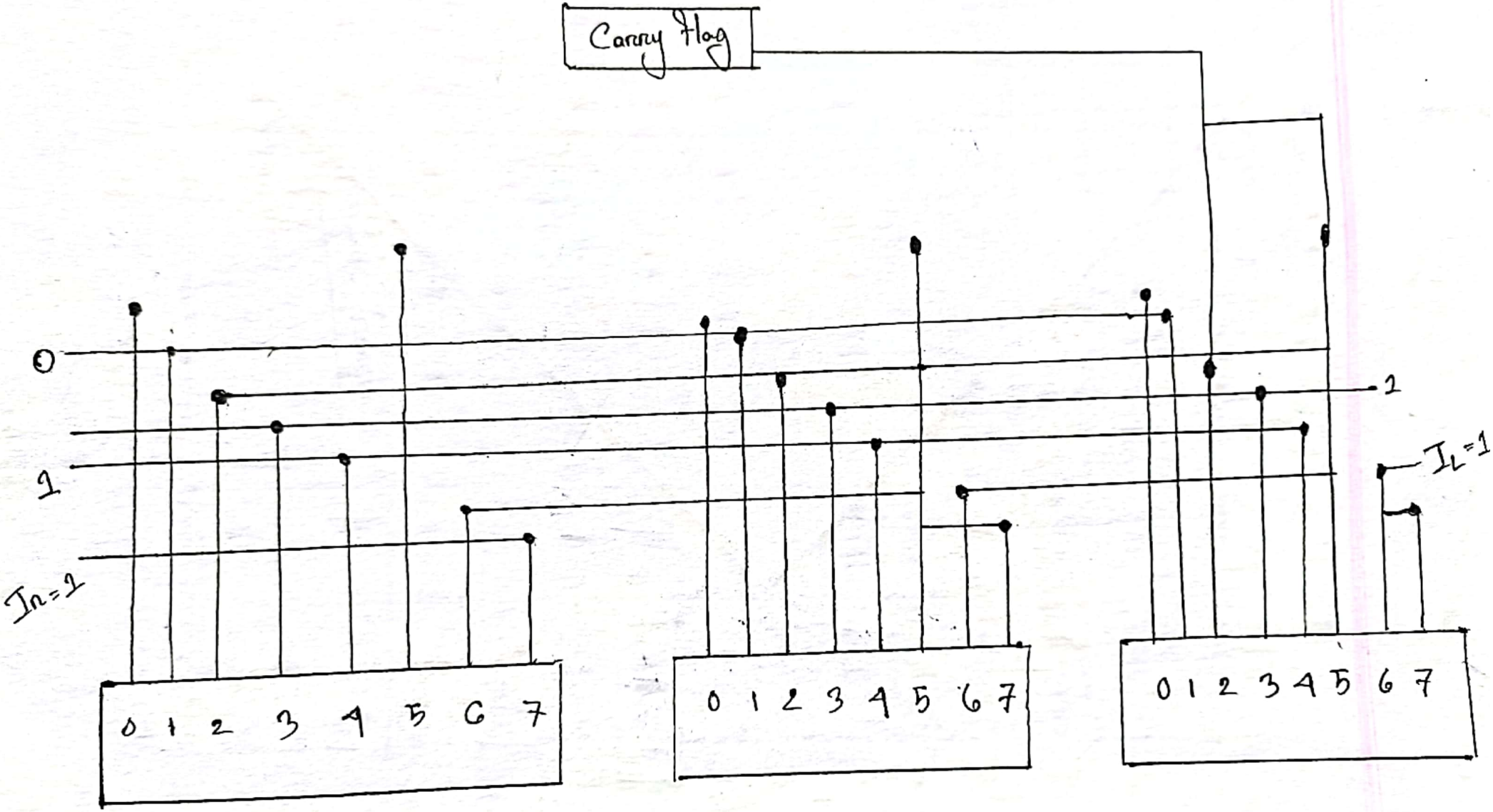
Ans to the Question No : 01

S_2	S_1	S_0	C_{in}	P	X_i	Y_i	Z_i
0	0	0	X	$A \oplus B$	A	B	X
0	0	1	X	$\overline{A} = A \oplus$ All 1's	A	All 1's	X
0	1	0	X	$A.0 = (A+\overline{0}) \oplus \overline{0}$	A+1	1	X
0	1	1	X	$1+B = (\overline{1+B}) \oplus 0$	1+B	0	X
1	0	0	0	A+1	A	0	0
1	0	0	1	A = A + All 0's + 1	A	0	1
1	0	1	0	$A-B = A+\overline{B}+1$	A	$\overline{B}+1$	0
1	0	1	1	$A-1-B = A+\overline{B}$	A	$\overline{B}$	1
1	1	0	0	A+0	A	0	0
1	1	0	1	A+0-1	A	0	1
1	1	1	0	A+1+B	A	B	0
1	1	1	1	A+B	A	B	1

Ans to the Question: 02

3 Bit Shifter Design



Ans to the Question : 03

			Control Word			
	A	B	D	F	C_{in}	H
	1 2 3	4 5 6	7 8 9	10 11 12	13	14 15 16
i) $R_1 \leftarrow R_1 + R_4$	0 0 1	1 0 0	0 0 1	1 1 1	1	1 0 1
ii) $R_3 \leftarrow 0$	0 0 0	0 0 0	0 1 1	1 0 0	1	1 0 1
iii) R_1 And R_2	0 0 1	0 1 0	0 0 0	0 1 0	1	1 0 1
iv) $R_5 \leftarrow$ SHR R_6	1 1 0	1 1 0	1 0 1	0 1 1	1	1 1 1
v) $R_7 \leftarrow$ CRC R_7	1 1 1	1 1 1	1 1 1			0 0 0

Ans to the Question : 04

(a)

Here, $P_a = 1$ & $P_s = 1$

1) $A = (+A) + (-B)$

$B = (+A) + (+B)$

$A = 5$ & $B = 2$, $A > B$

Flow chart :

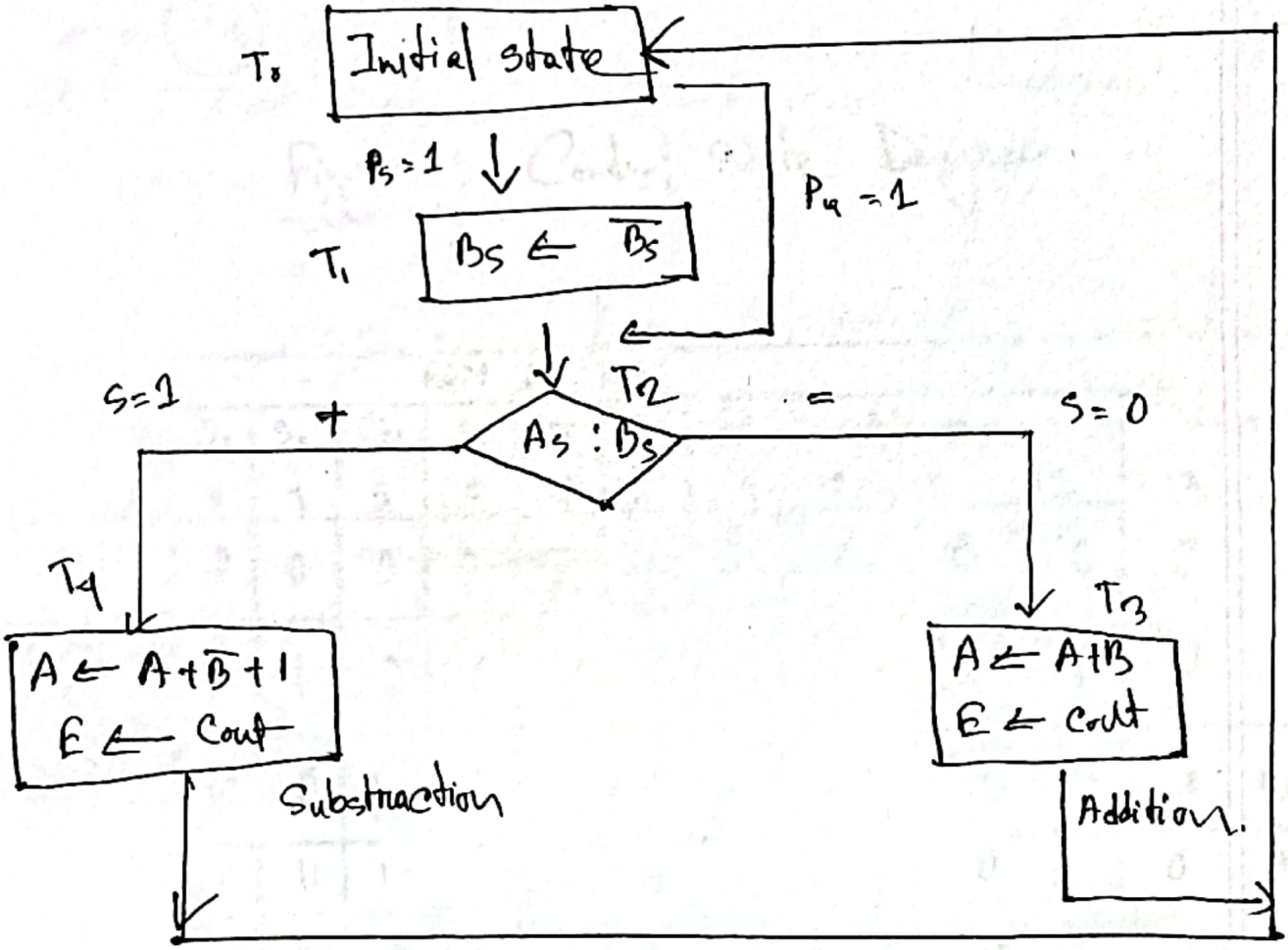


Figure : Addition & Subtraction operation flow chart.

(b)

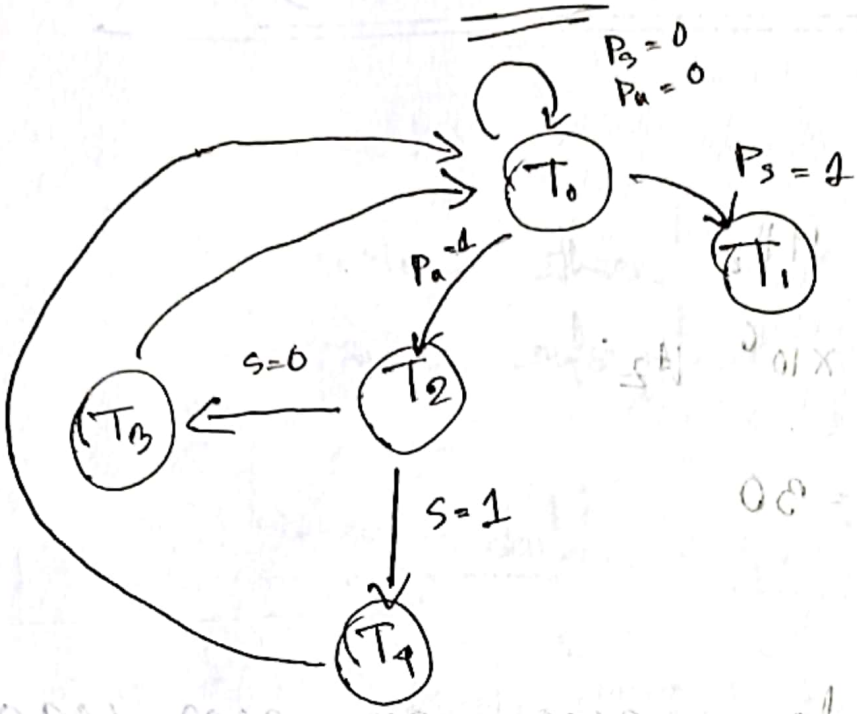
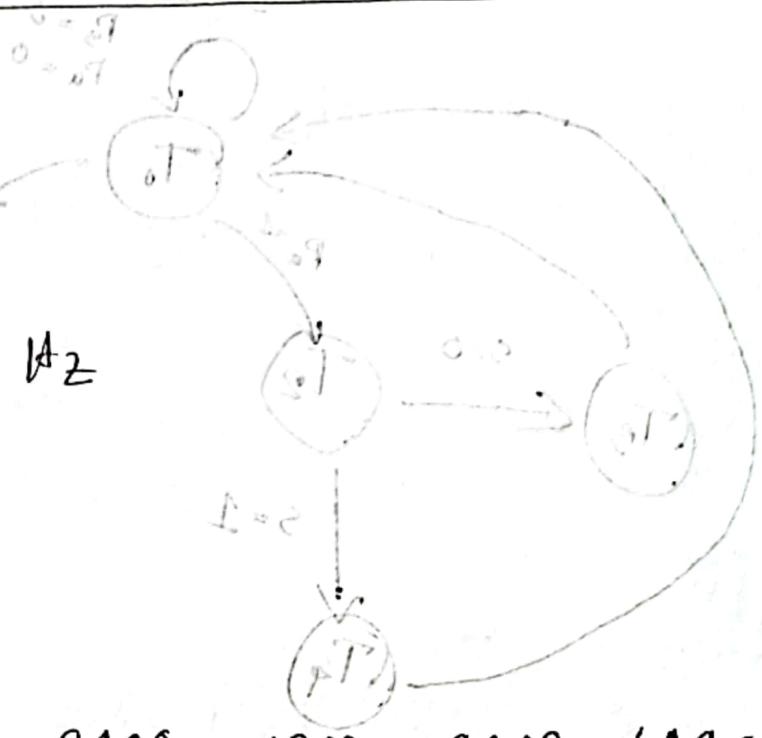


Figure: Control State Diagram

ROM Address	ROM OUTPUT													
	X	S_2	S_1	S_0	C_{in}	L	Y	Z	W	Address			Select	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
0 0 0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
0 0 1	0	0	0	1	0	0	1	0	0	0	0	1	0	1
0 1 0	0	1	0	0	1	0	0	0	0	1	0	0	1	0
0 1 1	0	1	1	1	1	1	0	0	0	0	0	0	0	1
1 0 0	0	1	0	1	0	1	0	0	0	0	0	0	0	1

Ans to the Question No : 05



Here,

$$f_{osc} = 2 \text{ MHz}$$

$$= 2 \times 10^6 \text{ Hz}$$

$$UBRR_n = 30$$

We know,

Standard baud Rate = 2400, 4800, 9600, 14400, 19200

for asynchronous normal mode :

$$\text{Baud Rate} = \frac{f_{osc}}{(16\{UBRR_n + 1\})}$$

$$= \frac{2 \times 10^6}{16(30+1)}$$

$$= 1032.2580$$

Baud error $= \{(4800 - 4032.258)/4800\} \times 100\%$

$= 0.159 < \pm 2\%$

For this mode there will be no communication error to the information.

For asynchronous double speed mode:

$$\text{Baud Rate} = \frac{f_{osc}}{8(UBRR_n + 1)}$$

$$= \frac{2 \times 10^6}{8(30+1)} = 8064.51 = 8065$$

$\therefore$ Baud Error $= \{(9600 - 8065)/9600\} \times 100\%$

$= 0.159\% < \pm 2\%$

Here, no communication error will happen.

For Synchronous master mode:

Baud Rate: $= \frac{f_{osc}}{2(UBRR_n + 1)}$

$= \frac{2 \times 10^6}{2(30+1)}$

$= 32258.07$

$= 32259$

So, Baud Error $= \frac{19200 - 32259}{19200} \times 100\%$

$= -0.680\% \angle \pm 2\%$.

Here, also for this mode no communication error will happen.

Ans the the Question: 06

We have,

$f_{clock} = 12\ MHz = 12 \times 10^6\ Hz$

When prescaler,

$N = 1$

$f_{ocnx\ PCPWM} = \frac{f_{clk}}{N.\ 510}$

$= \frac{12 \times 10^6\ Hz}{1.\ 510}$

$= 23529.411$

$= 23529\ Hz$

When, $N = 8$,

$f_{ocnx\ PCPWM} = \frac{12 \times 10^6\ Hz}{8.\ 510}$

$= 2941.176$

$= 2942\ Hz$

When, N = 64,

$$f_{OCNX\,PCPWM} = \frac{12 \times 10^6\ Hz}{64 \cdot 510}$$

$$= 367.647$$

$$= 368$$

When, N = 256,

$$f_{OCNX\,PCPWM} = \frac{12 \times 10^6}{256 \times 510}$$

$$= 91.911$$

$$= 92\ Hz$$

When, N = 1024

$$f_{OCNX\,PCPWM} = \frac{12 \times 10^6}{1024 \times 510}$$

$$= 22.977$$

$$= 23\ Hz.$$