Q	T	Q(t+1)
0	0	0
0	1	1
1	0	1
1	1	0

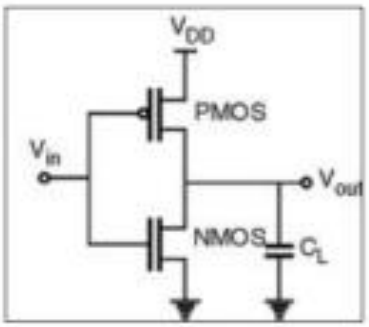
Q	D	Q(t+1)
0	0	0
0	1	1
1	0	0
1	1	1

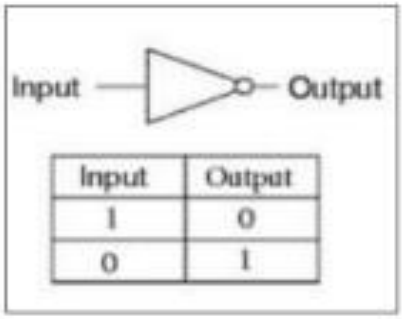
S	R	Q_n	Q_{n+1}	
0	0	0	0	Qn (same as input)
0	0	1	1	
0	1	0	0	0
0	1	1	0	
1	0	0	1	1
1	0	1	1	
1	1	0	x	Invalid
1	1	1	x	

J	K	Q_N	Q_{N+1}
0	0	0	0
0	0	1	1
0	1	0	0
0	1	1	0
1	0	0	1
1	0	1	1
1	1	0	1
1	1	1	0

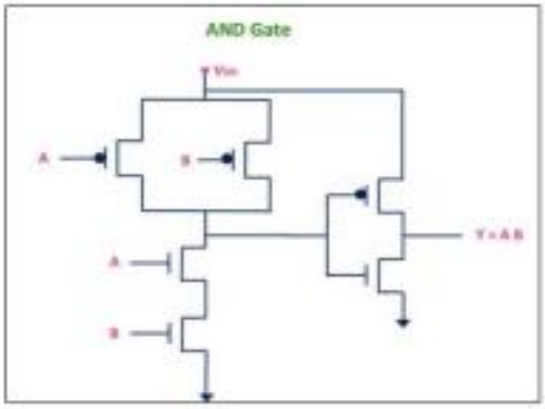
Truth Table for 2x1 MUX :-

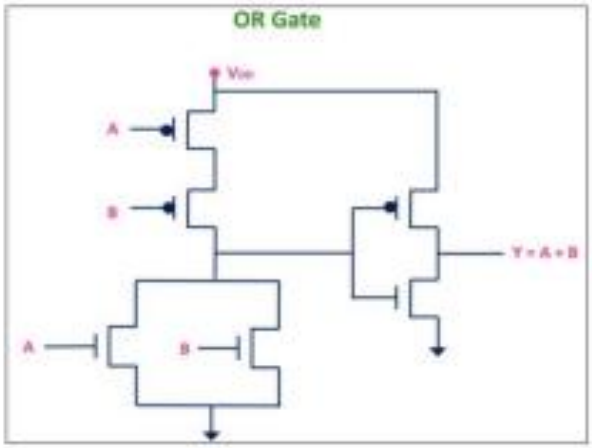
S	A	B	Y
0	0	x	0
0	1	x	1
1	x	0	0
1	x	1	1

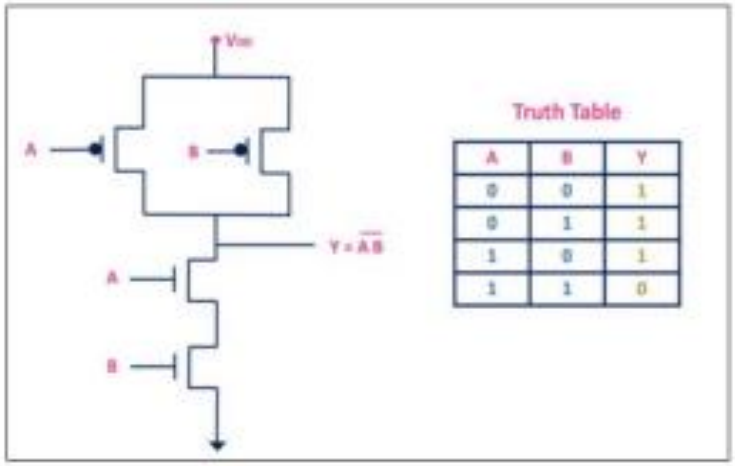




Input	Output
1	0
0	1



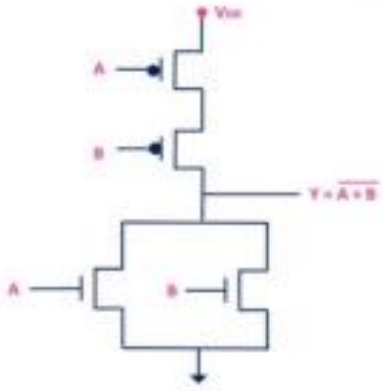




Truth Table

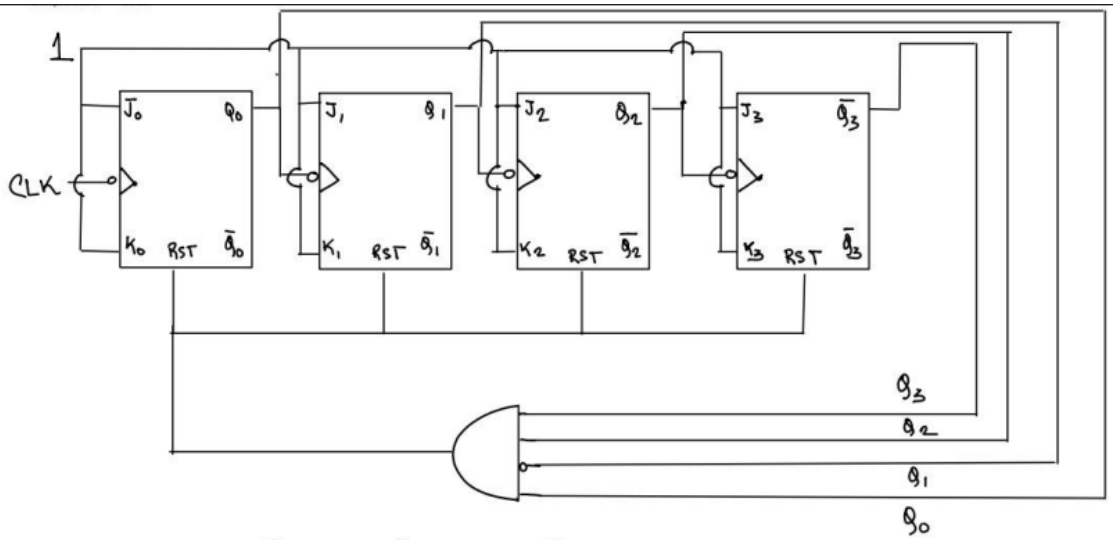
A	B	Y
0	0	1
0	1	1
1	0	1
1	1	0

NOR Gate

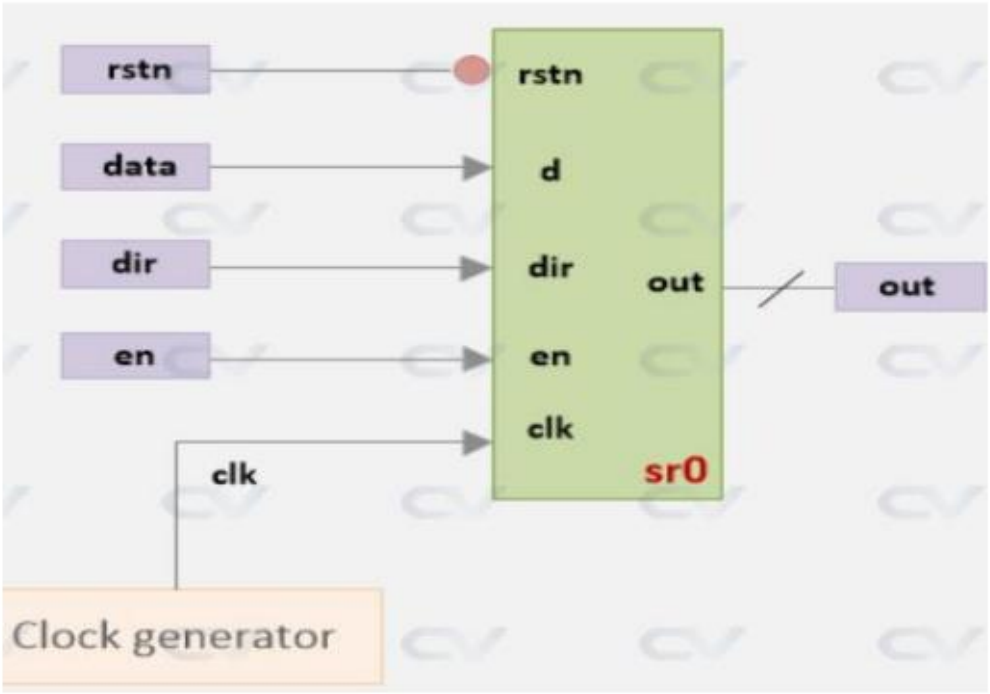


Truth Table

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0



MOD-13 ASYNCHRONOUS UP COUNTER USING JK-F/F

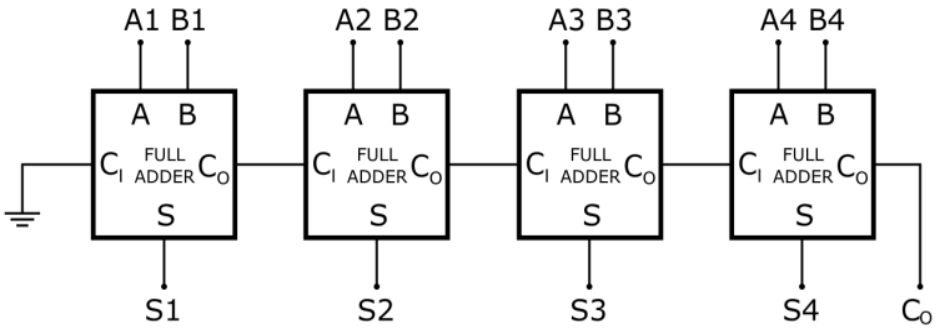


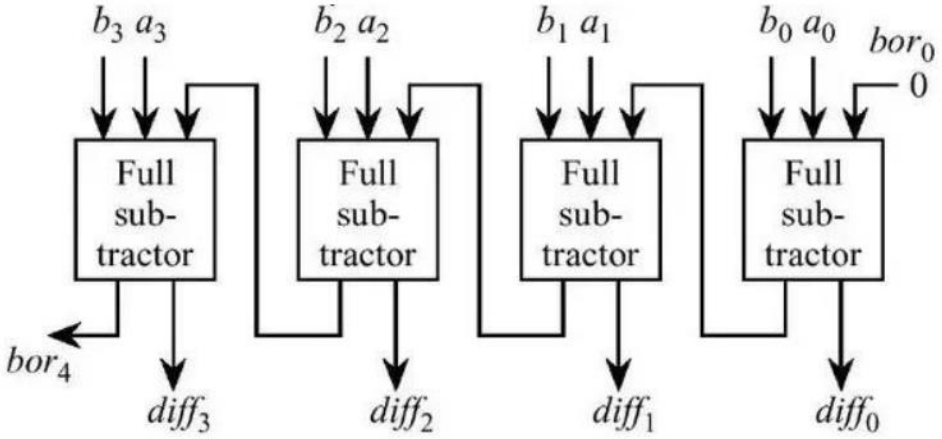
sum = A (xor) B
carry = A (and) B

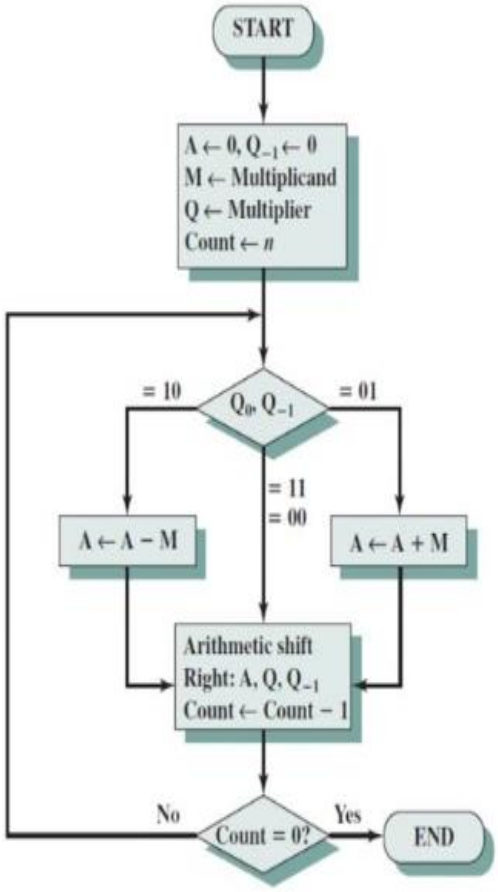
sum = A (xor) B (xor) C
Carry = A.B + B.C + A.C

D = A (xor) B
Bout = ~A (and) B

D = A (xor) B (xor) C
Bout = ~A.B + B.C + ~A.C



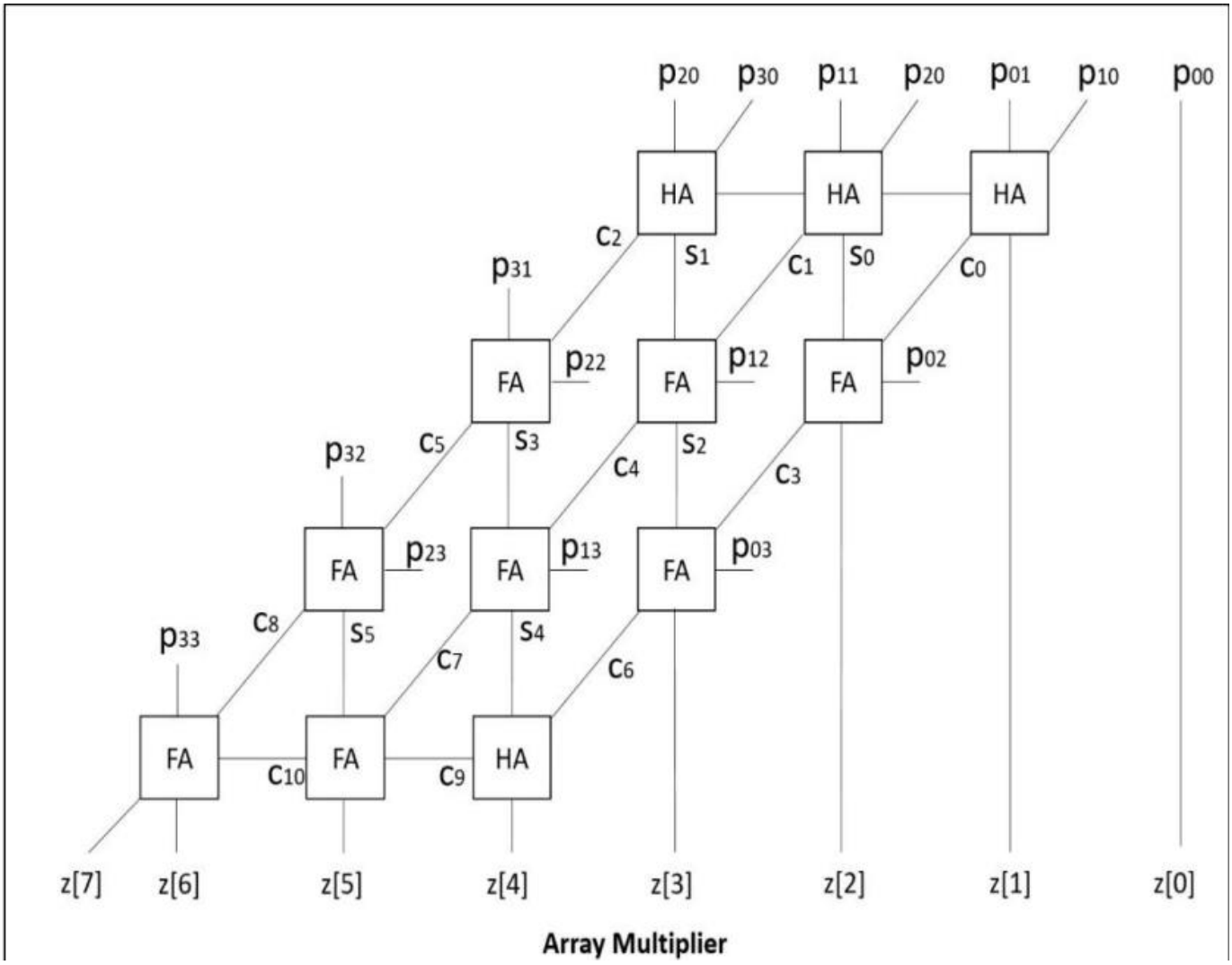




A	Q	Q_{-1}	M		
0000	0011	0	0111	Initial values	
1001	0011	0	0111	A←A − M	First cycle
1100	1001	1	0111	Shift	
1110	0100	1	0111	Shift	Second cycle
0101	0100	1	0111	A←A + M	Third cycle
0010	1010	0	0111	Shift	
0001	0101	0	0111	Shift	Fourth cycle

Booth's Algorithm

Ref: "Computer Organization and Architecture Designing for Performance" By William Stallings



Array Multiplier

$Q_{n+1} = T + \bar{T}$

$Q_{n+1} = S + Q_n \bar{R}$

$Q_{n+1} = D$

CLK	J	K	Q_{n+1}	
0	x	x	Q_n	memory
1	0	0	Q_n	
1	0	1	0	
1	1	0	1	
1	1	1	$\bar{Q}_n$	(toggle)

$Q_{n+1} = \bar{Q}_n J + Q_n \cdot \bar{K}$

$$Q_{n+1} = Q_n \oplus T$$

Clk	S	R	Q	$\bar{Q}$
0	x	x	Memory	
1	0	0	Memory	
1	0	1	0	1
1	1	0	1	0
1	1	1	Not used	