Nova Sultana
ID: 2018-1-60-124

Answer to the Question No:03

3 bit serial in-parallel out Bidirectional shift register.

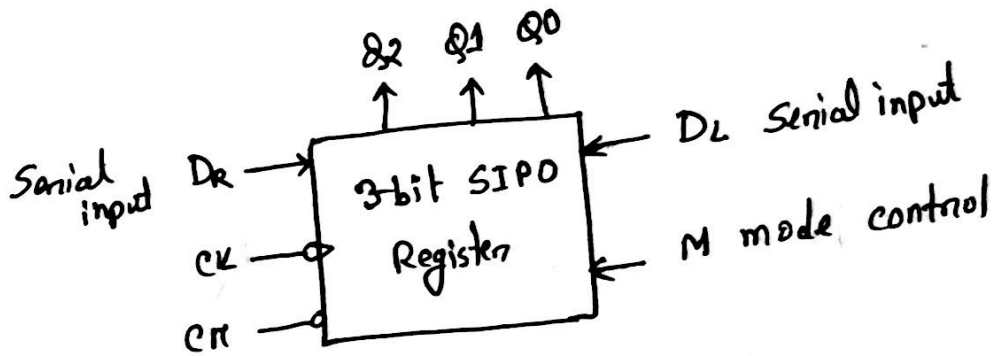


Fig: Block diagram.

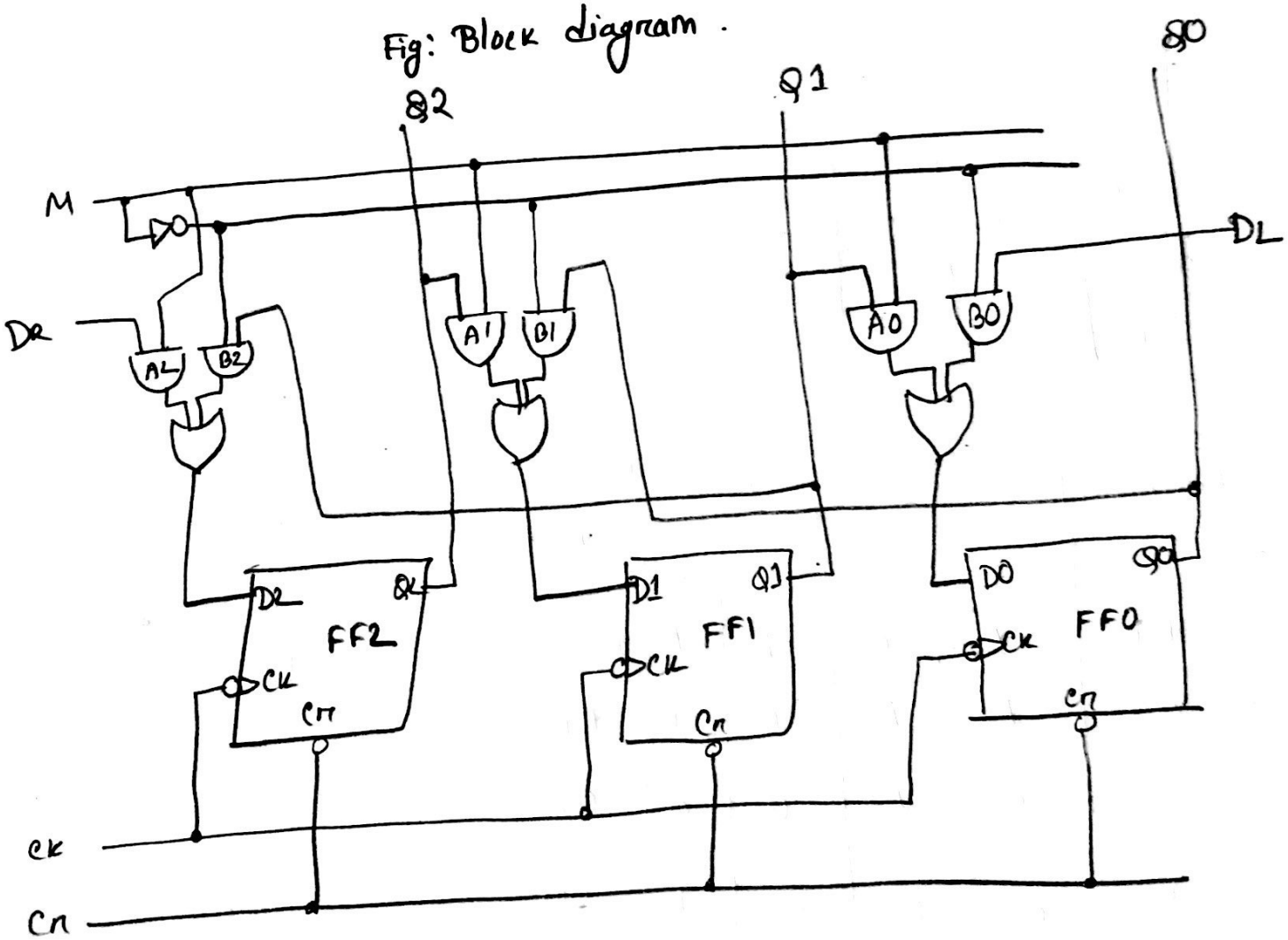


Fig: Logic diagram.

Answer to the Question No:05

```
module fsm (input i, clock, reset, output reg [1:0] out);
reg[1:0] currentstate, nextstate;
localparam [1:0]  A = 2'b00,
                  B = 2'b01,
                  C = 2'b10,
                  D = 2'b11;

always @(*)
    case (currentstate)
        A: begin
           nextstate = (i==0)? C:D;
           out = 2'b10;
           end
        B: begin
           nextstate = (i==0)? A:C;
           out=(i==0)? 2'b01 :2'b11;
           end
        C:
           begin
           nextstate = (i==0)? D:A;
           out=(i==0)? 2'b10 : 2'b11;
           end
        D:
          begin
           nextstate = (i==0)?C:A;
           out = (i==0)? 2'b20 2'b10 : 2'b01;
          end
endcase
```

PTO

```
always @(negedge clock, posedge reset)
  if (reset)
    cunnent state <= A;
  else
    cunnentstate <= nextstate;
endmodule.
```

Answer to the Question No: 02

D-Flip Flop

Q_n	Q_{n+1}	D_n
0	0	0
0	1	1
1	0	0
1	1	1

Present state $Q_1 n\ Q_2 n$	Next state, $Q_{1n+1}\ Q_{2n+1}$ $x=0$	$x=1$	Flip-flop input $x=0$ D_1	D_2	$x=1$ D_1	D_2	Output z_1, z_2 $x=0$	$x=1$
00	11	01	1	1	0	1	11	00
01	11	11	1	1	1	1	00	11
11	00	10	0	0	1	0	10	10
10	10	00	1	0	0	0	01	10

D1

Q_1Q_2 \ x	0	1
00	1	0
01	1	1
11	0	1
10	1	0

$D1 = Q1'_n x' + Q2_n x + Q2'_n x'$

D2

Q_1Q_2 \ x	0	1
00	1	1
01	1	1
11	0	0
10	0	0

$D2 = Q1'_n$

Z_1

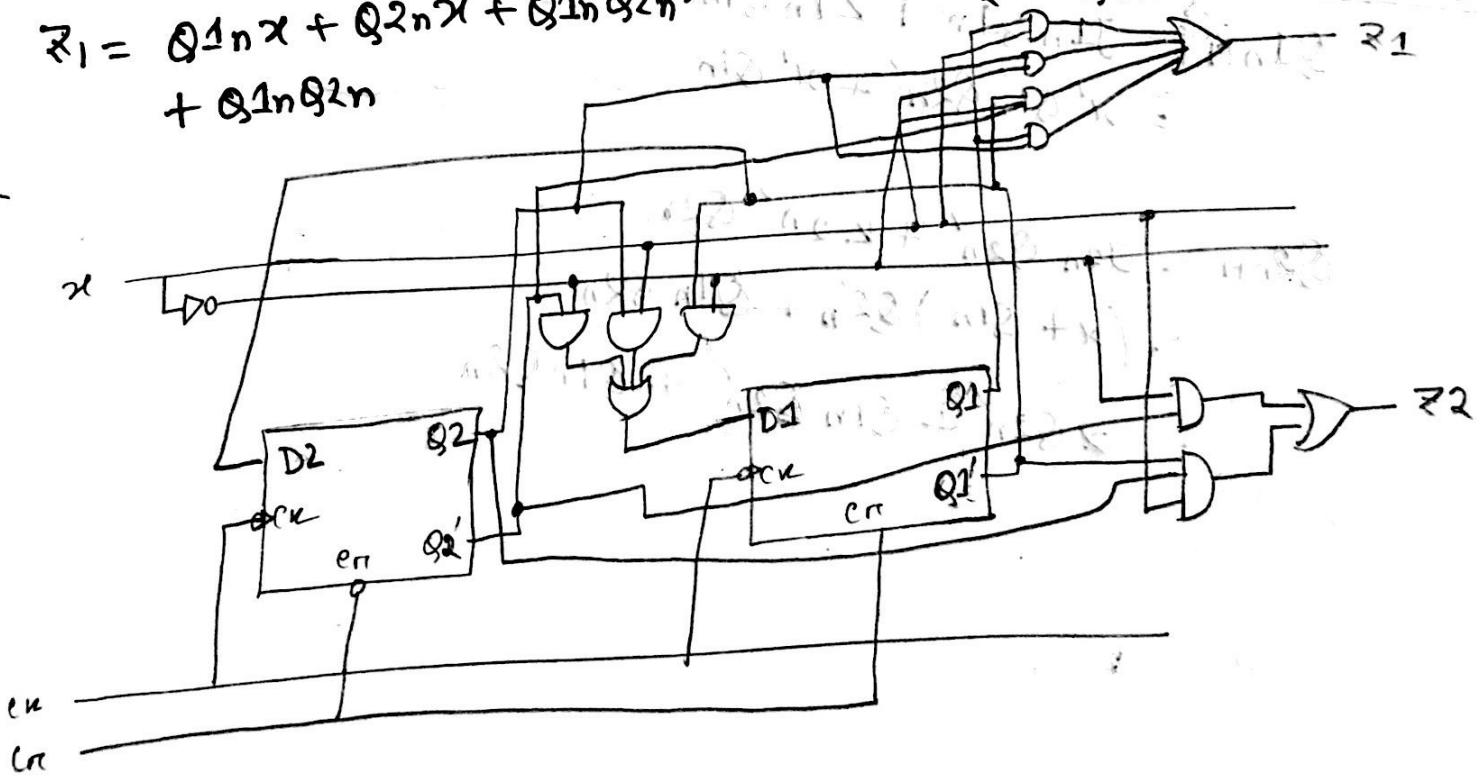
Q_1Q_2 \ x	0	1
00	1	0
01	0	1
11	1	1
10	0	1

$Z_1 = Q1_n x + Q2_n x + Q1'_n Q2'_n x' + Q1_n Q2_n$

Z_2

Q_1Q_2 \ x	0	1
00	1	0
01	0	1
11	0	0
10	1	0

$Z_2 = Q2'_n x' + Q1'_n Q2_n x$



Answer to the Question No: 01

Output equation:

$$Z = Q2n\,(x1\,Q1n + x\,Q1'n)$$
$$= x'Q1n\,Q2n + x\,Q1'n\,Q2n$$

Excitation equation:

$$J1n = x'Q2'n$$
$$J2n = x + Q1n$$
$$K1n = x$$
$$K2n = Q1'n$$

Next state equation:

$$Q1n+1 = J1n\,Q1'n + K1'n\,Q1n$$
$$= x'Q1'n\,Q2n' + x'Q1n$$

$$Q2n+1 = J2n\,Q2n' + K2n'\,Q2n$$
$$= (x + Q1n)\,Q2'n + Q1n\,Q2n$$
$$= x\,Q2n' + Q1n\,Q2n' + Q1n\,Q2n$$

Present state Q1n Q2n	Next state Q1n+1 Q2n+1 x=0		x=1		Output z Input x 0	1
00	1	0	0	1	0	0
01	0	0	0	0	0	1
11	1	1	0	1	1	0
10	1	1	0	1	0	0

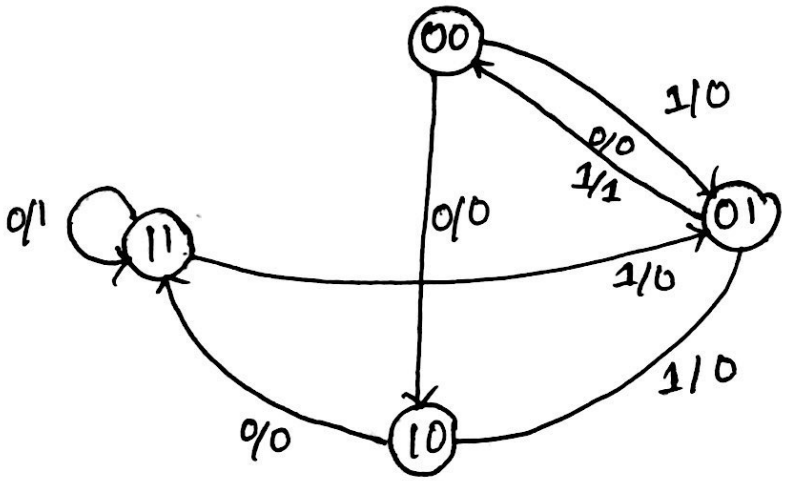


Fig: Transition diagram.

Answer to the Question No: 04

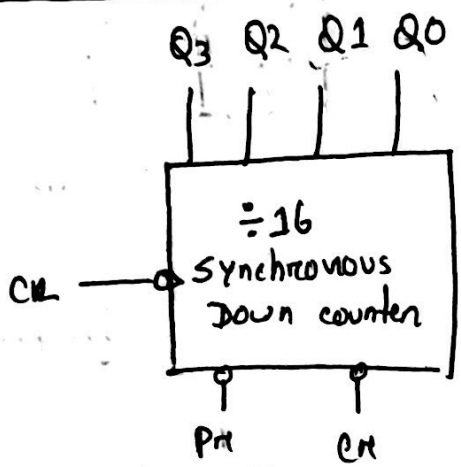


Fig: block - diagram.

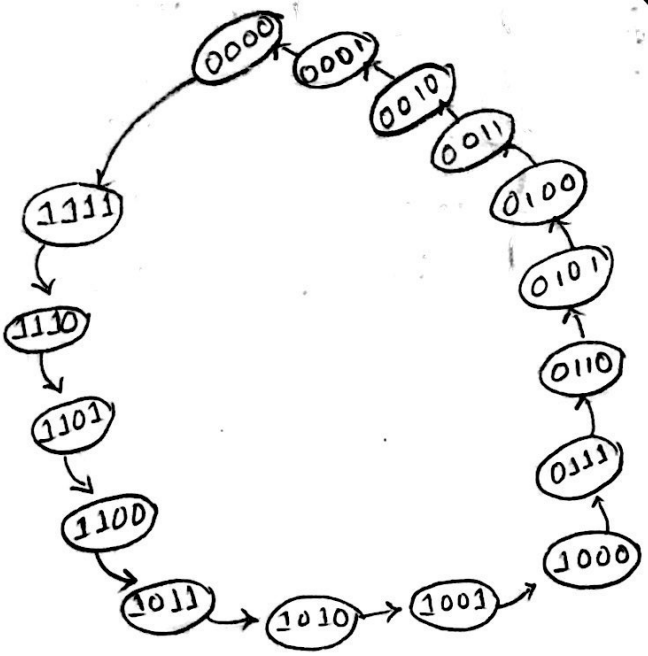


fig: Transition diagram.

Count Sequence

Q3	Q2	Q1	Q0
1	1	1	1
1	1	1	0
1	1	0	1
1	1	0	0
1	0	1	1
1	0	1	0
1	0	0	1
1	0	0	0
0	1	1	1
0	1	1	0
0	1	0	1
0	1	0	0
0	0	1	1
0	0	1	0
0	0	0	1
0	0	0	0
1	1	1	1

Excitation table :

Present state				Next state				FlipFlop input			
Q_{3n}	Q_{2n}	Q_{1n}	Q_{0n}	Q_{3n+1}	Q_{2n+1}	Q_{1n+1}	Q_{0n+1}	T_3	T_2	T_1	T_0
0	0	0	0	1	1	1	1	1	1	1	1
0	0	0	1	0	0	0	0	0	0	0	1
0	0	1	0	0	0	0	1	0	0	1	1
0	0	1	1	0	0	1	0	0	0	0	1
0	1	0	0	0	0	1	1	0	1	1	1
0	1	0	1	0	1	0	0	0	0	0	1
0	1	1	0	0	1	0	1	0	0	1	1
0	1	1	1	0	1	1	0	0	0	0	1
1	0	0	0	0	1	1	1	1	1	1	1
1	0	0	1	1	0	0	0	0	0	0	1
1	0	1	0	1	0	0	1	0	0	1	1
1	0	1	1	1	0	1	0	0	0	0	1
1	1	0	0	1	0	1	1	0	1	1	1
1	1	0	1	1	1	0	0	0	0	0	1
1	1	1	0	1	1	0	1	0	0	1	1
1	1	1	1	1	1	1	0	0	0	0	1

(T3)

Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	(1)			
01				
11				
10	(1)			

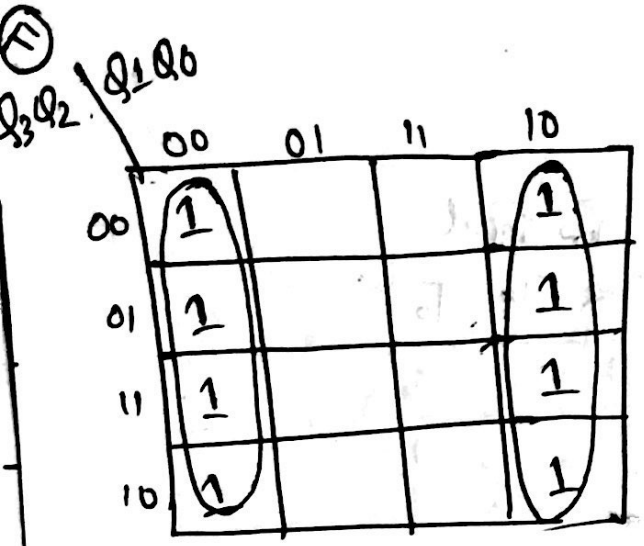
$T_3 = Q_2'Q_1'Q_0'$

(T2)

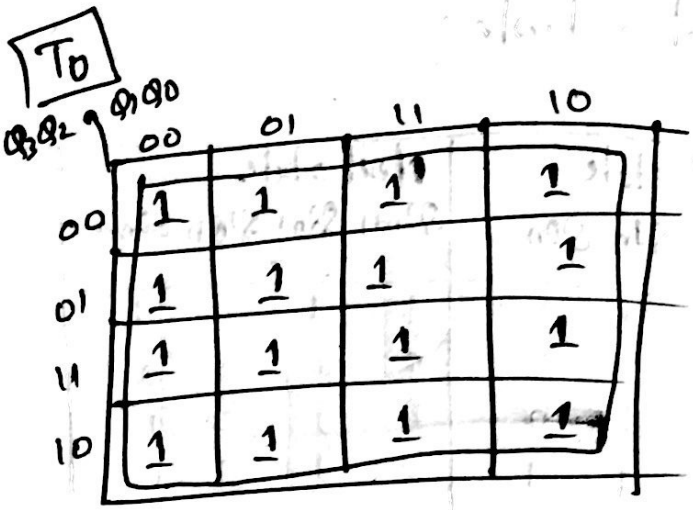
Q_3Q_2 \ Q_1Q_0	00	01	11	10
00	1			
01	1			
11	1			
10	1			

$T_2 = Q_1'Q_2'$

(i)



$T1 = Q0'$



$T0 = 1$

Here,

$T_3 = Q2'Q1'Q0'$

$T_2 = Q1'Q2'$

$T1 = Q0'$

$T0 = 1$

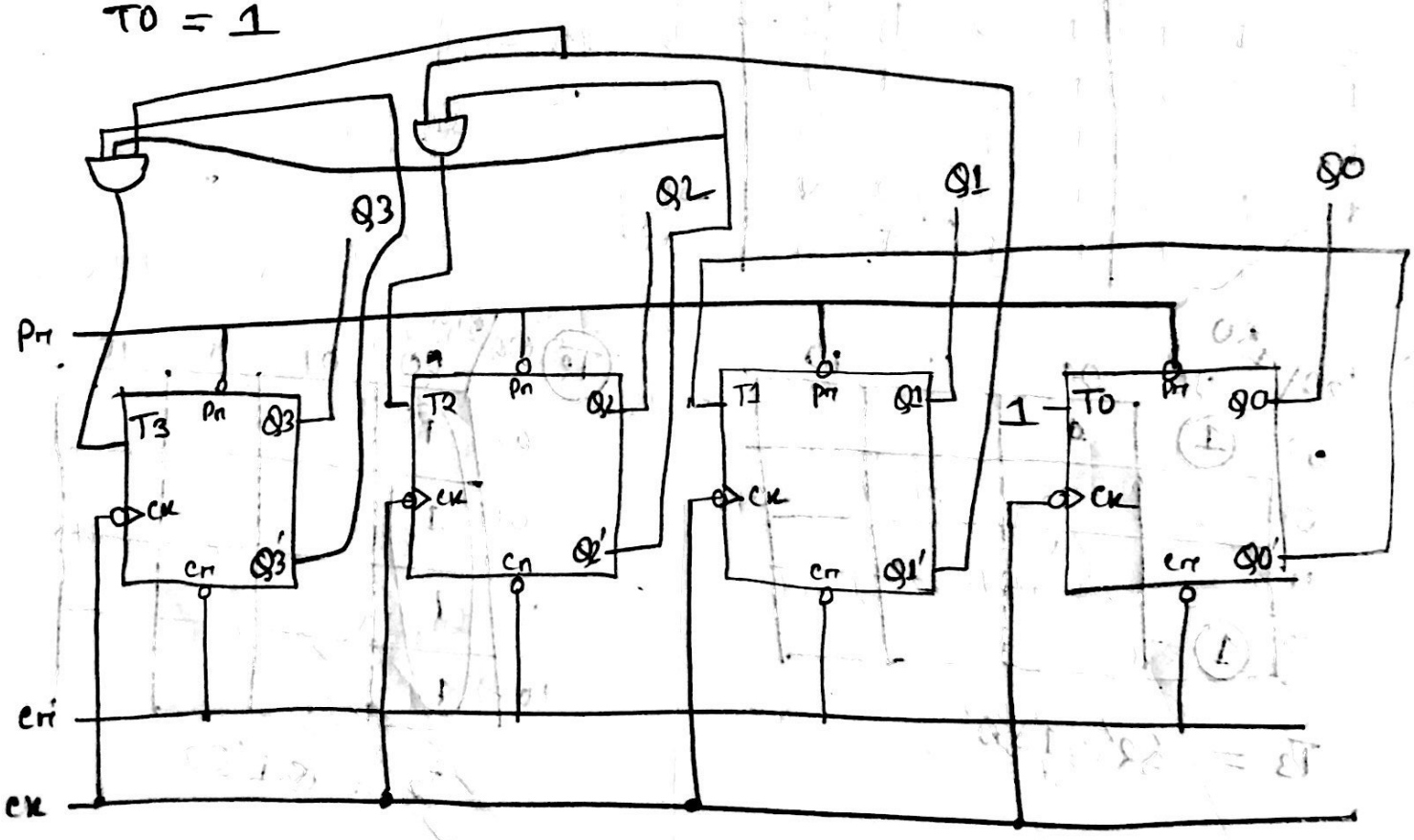


Fig: Logic diagram.