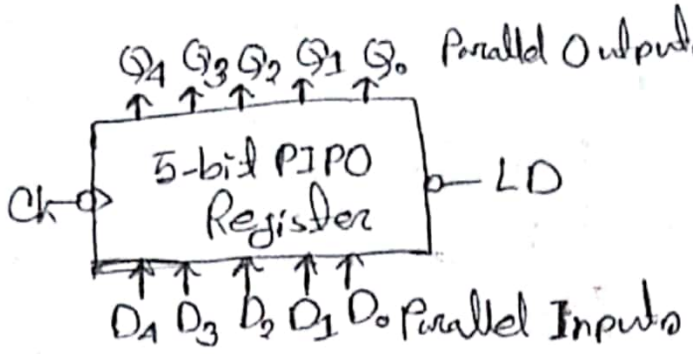
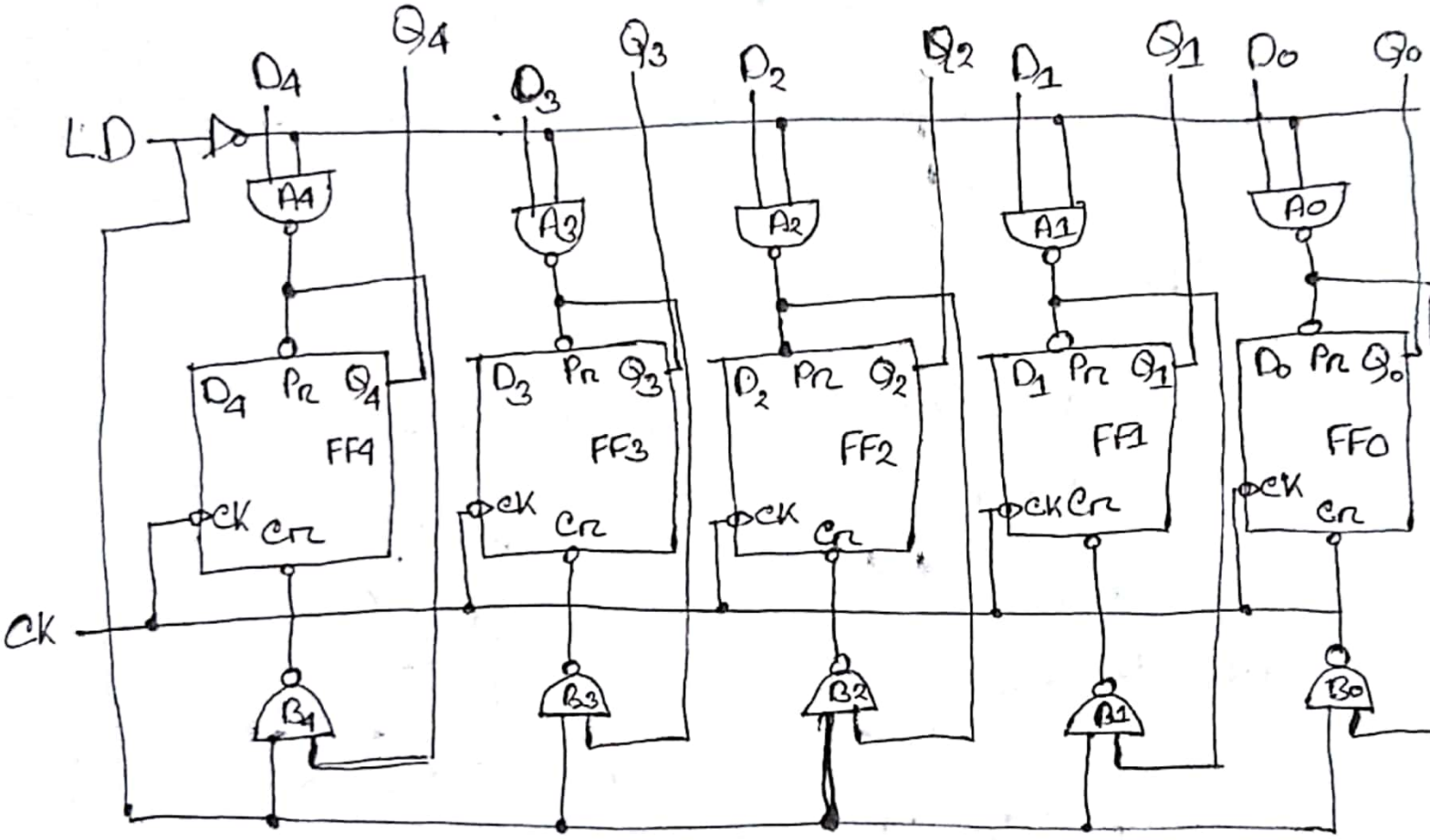
Asma Akhter
2019-3-60-033

Answer to the Question No: 3

Parallel-in, Parallel-out (PIPO):



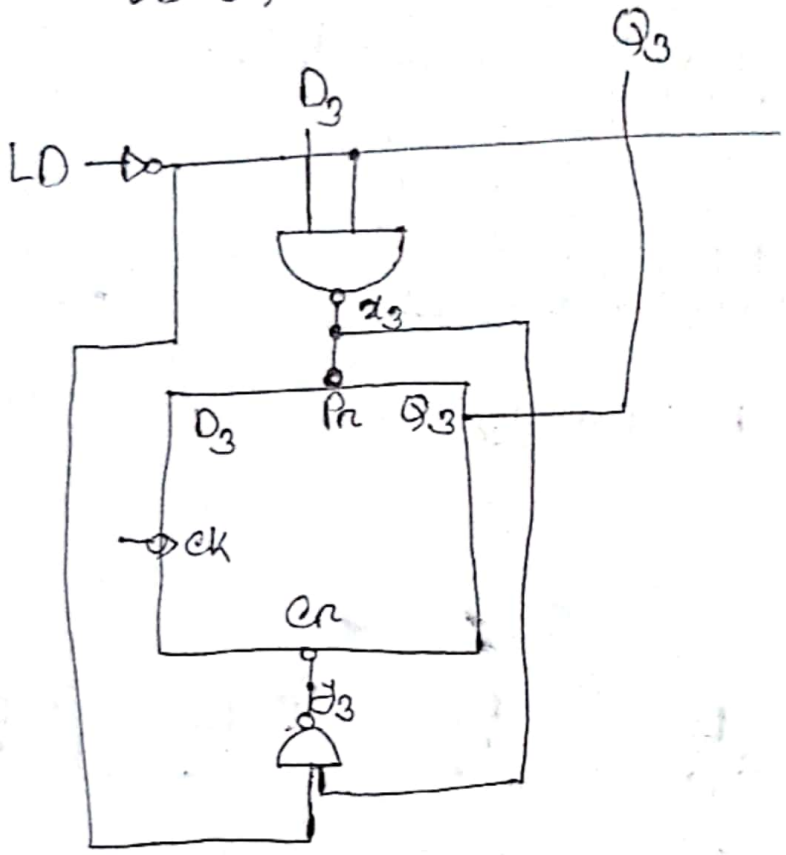
(a) Block diagram



(b) Logic Diagram

Parallel-In Parallel-Out Register

LD=0 , Ck=0



LD=0

$x_3 = (D_3 . LD')'$

$= (D_3 . 1)'$

$x_3 = D_3'$

$Pr = x_3 = D_3'$

$y_3 = (x_3 . LD')'$

$= (x_3 . 1)'$

$= (D_3')'$

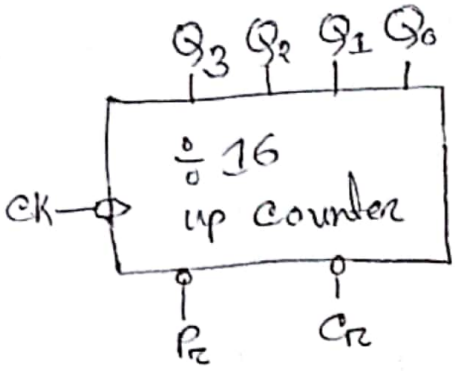
$y_3 = D_3$

$Cr = y_3 = D_3$

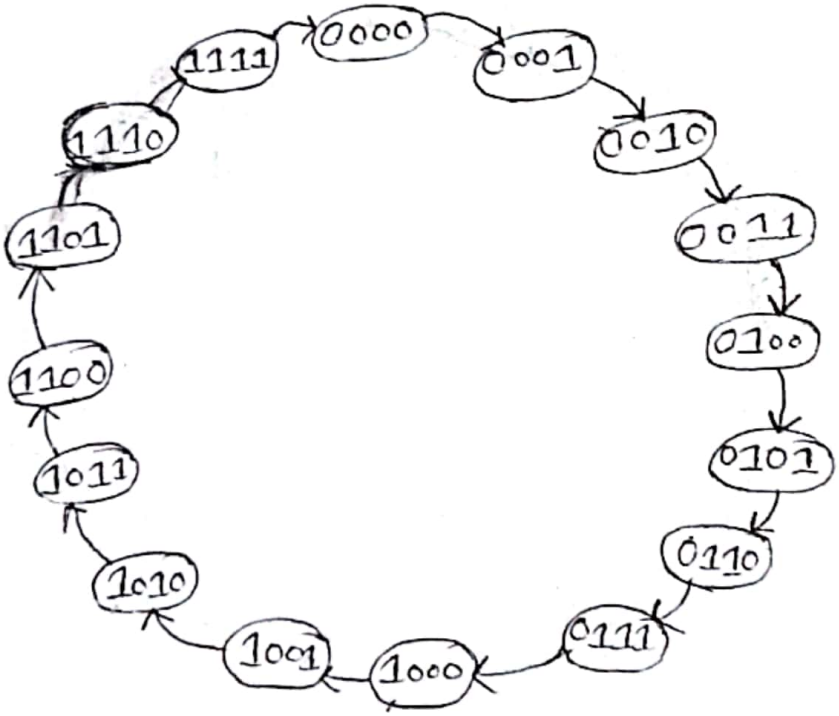
D_3	Pr	Cr	Q_3
0	1	0	0
1	0	1	1

Answer to the Question No: 4

a ÷ 16 Synchronous up Counter:



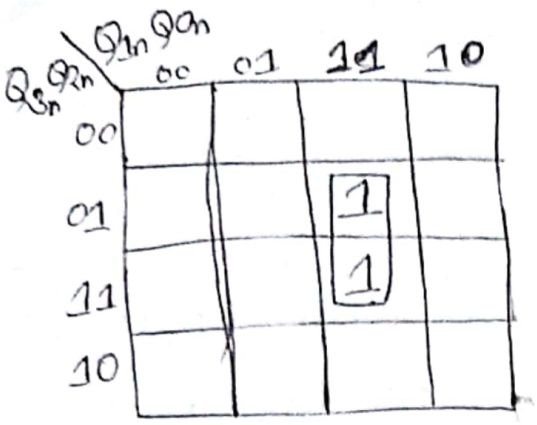
(a) Block diagram



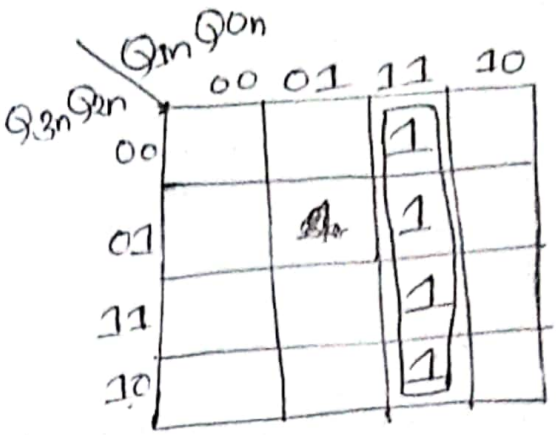
(b) Transition Diagram

Excitation Tables:

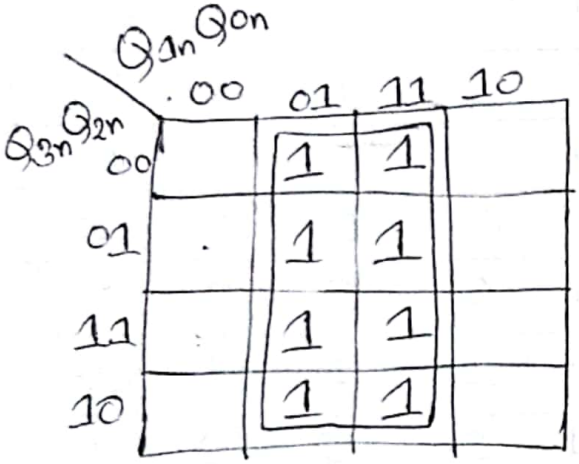
Present State				Next State				Flip-Flop Inputs			
Q_{3n}	Q_{2n}	Q_{1n}	Q_{0n}	Q_{3n+1}	Q_{2n+1}	Q_{1n+1}	Q_{0n+1}	T_3	T_2	T_1	T_0
0	0	0	0	0	0	0	1	0	0	0	1
0	0	0	1	0	0	1	0	0	0	1	1
0	0	1	0	0	0	1	1	0	0	0	1
0	0	1	1	0	1	0	0	0	1	1	1
0	1	0	0	0	1	0	1	0	0	0	1
0	1	0	1	0	1	1	0	0	0	1	1
0	1	1	0	0	1	1	1	0	0	0	1
0	1	1	1	1	0	0	0	1	1	1	1
1	0	0	0	1	0	0	1	0	0	0	1
1	0	0	1	1	0	1	0	0	0	1	1
1	0	1	0	1	0	1	1	0	0	0	1
1	0	1	1	1	1	0	0	0	1	1	1
1	1	0	0	1	1	0	1	0	0	0	1
1	1	0	1	1	1	1	0	0	0	1	1
1	1	1	0	1	1	1	1	0	0	0	1
1	1	1	1	0	0	0	0	1	1	1	1



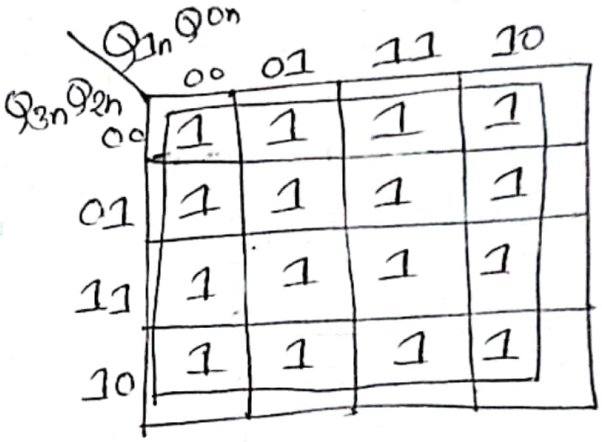
$T_3 = Q_{2n} Q_{1n} Q_{0n}$



$T_2 = Q_{1n} Q_{0n}$

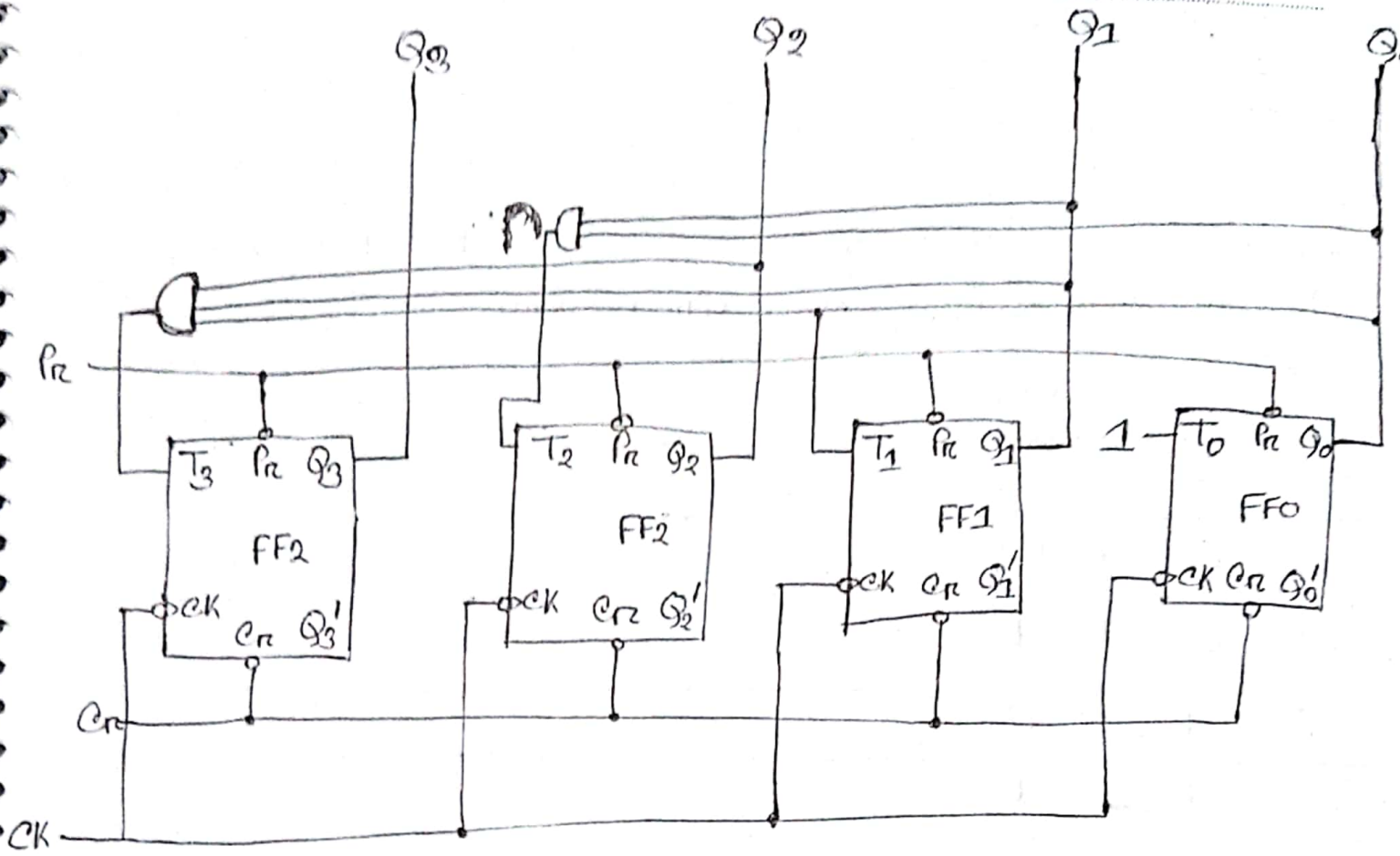


$T_2 = Q_{0n}$

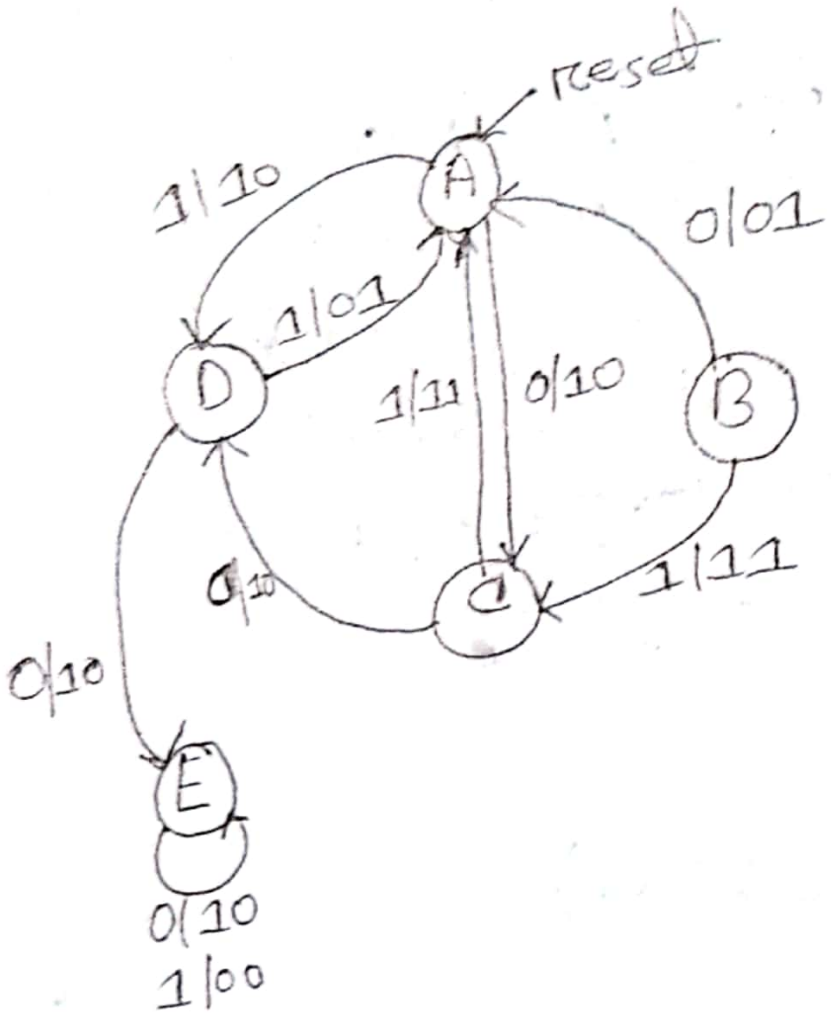


$T_0 = 1$

Date : .....



Answer to the Question No: 5




```
module Syn_S_circuit (input i, clock, reset,
                      output reg [1:0] out);

reg [2:0] currentState,
          nextState;
```

~~localparam [2:0]~~

localparam [2:0] A = 3'b000,
B = 3'b001,
C = 3'b010,
D = 3'b011,
E = 3'b100;

always @ (*)

case (currentState)

A: begin
nextState = (i==0)?C:D;
out = (i==0)?2'b10:2'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) ? E : A;
        out = (i==0) ? 2'b10 : 2'b01;
   end
E: begin
        nextstate = (i==0) ? E : E;
        out = (i==0) ? 2'b10 : 2'b00;
   end
default : begin
        nextstate = A;
        out = 3'bxxx;
   end
endcase
```

```
always @ (posedge clock, negedge reset)
    if (~reset)
            currentState <= A;
    else
        currentState <= nextState;
endmodule
```

Answer to the Question No: 1

Output Equation:

$$Z = (x + Q_{1n}) \times Q_{2n}$$

$$= x \cdot x Q_{2n} + x Q_{1n} Q_{2n}$$

$$= x Q_{2n} + x Q_{1n} Q_{2n}$$

1 1 1 1 1

Excitation Equations:

$$J_{1n} = (x' \oplus Q_{2n}')$$

$$= x' Q_{2n}' + x' Q_{2n}'$$

$$K_{1n} = x$$

$$J_{2n} = (x Q_{1n})'$$

$$= x' + Q_{1n}'$$

$$K_{2n} = Q_{1n}'$$

Date :

Next state equations:

$$Q_{1n+1} = J_{1n}Q_{1n}' + K_{1n}'Q_{1n}$$

$$= (xQ_{2n}' + x'Q_{2n}')Q_{1n}' + x'Q_{1n}$$

$$= \underset{1\ 0\ 0}{xQ_{1n}'Q_{2n}'} + \underset{0\ 0\ 0}{x'Q_{1n}'Q_{2n}'} + \underset{0\ 1}{x'Q_{1n}}$$

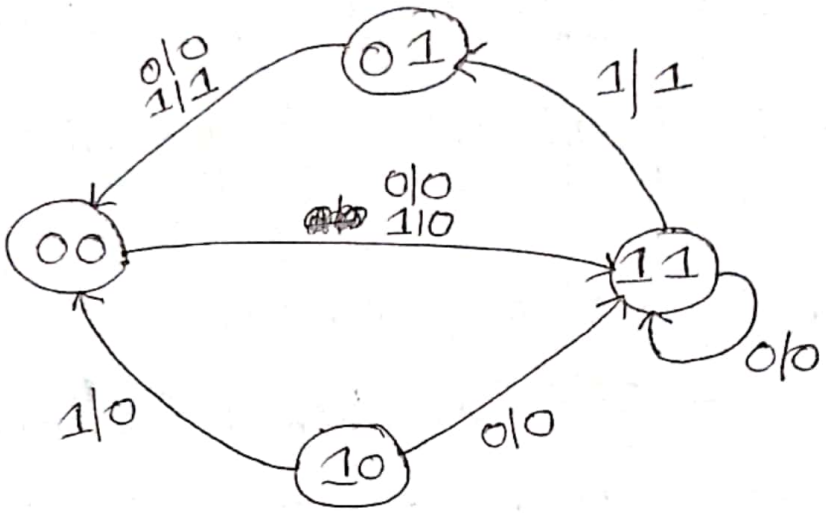
$$Q_{2n+1} = J_{2n}Q_{2n}' + K_{2n}'Q_{2n}$$

$$= (x' + Q_{1n}')Q_{2n}' + Q_{1n}'Q_{2n}$$

$$= \underset{0\ 0}{x'Q_{2n}'} + \underset{0\ 0}{Q_{1n}'Q_{2n}'} + \underset{1\ 1}{Q_{1n}Q_{2n}}$$

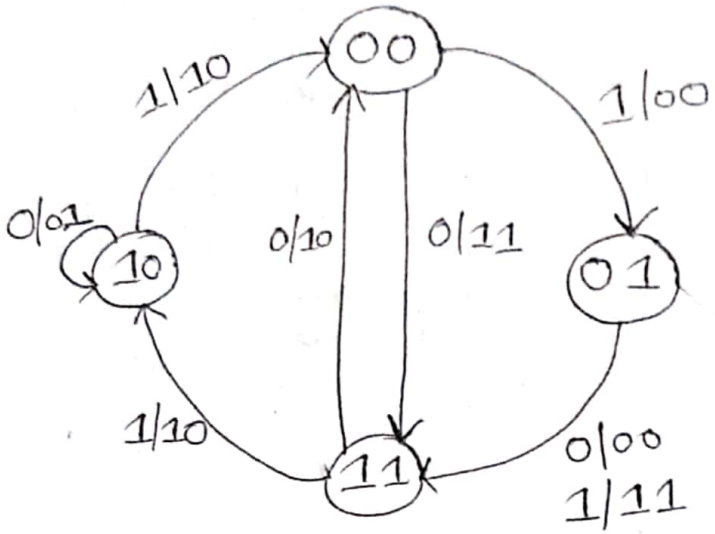
Present state $Q_{1n}\ Q_{2n}$	Next State $Q_{1n+1} \times Q_{2n+1}$ Input X		Output Z Input X	
	0	1	0	1
0 0	1 1	1 1	0	0
0 1	0 0	0 0	0	1
1 1	1 1	0 1	0	1
1 0	1 1	0 0	0	0

Transition diagram



Date

Answer to the Question No: 2

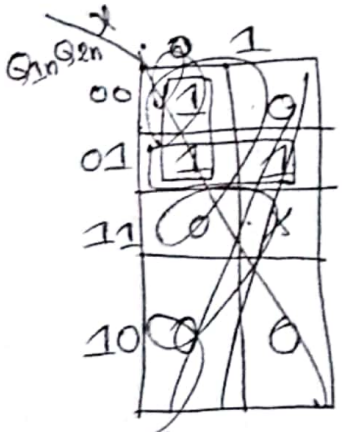


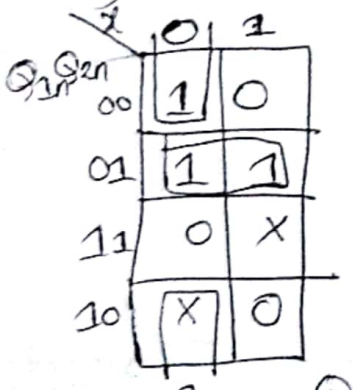
Excitation Table:

Q_n	Q_{n+1}	S_n	R_n
0	0	0	X
0	1	1	0
1	0	0	1
1	1	X	0

Present State $Q_{1n}\ Q_{2n}$	Next state Q_{1n+1} $x=0$	Next state Q_{2n+1} $x=1$	Flip-Flop Inputs $x=0$ $S_{1n}R_{1n}$	$S_{2n}R_{2n}$	$x=1$ $S_{1n}R_{1n}$	$S_{2n}R_{2n}$	Output z_1, z_2 Input x 0	1
0 0	11	01	10	10	0X	10	11	00
0 1	11	11	10	X0	10	X0	00	11
1 1	00	10	01	01	X0	01	10	10
1 0	10	00	X0	0X	01	0X	01	10

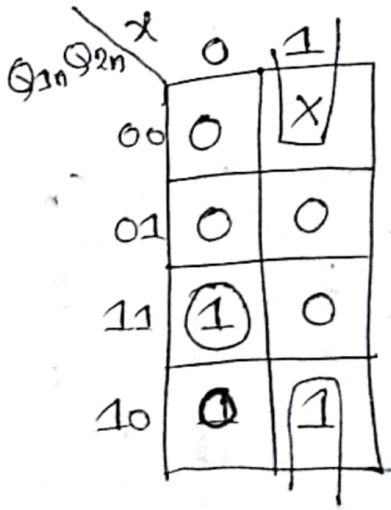
S_{1n}:





$S_{1n} = Q_{1n}'Q_{2n} + Q_{2n}'x'$

R_{1n}:



$R_{1n} = Q_{1n}Q_{2n}x' + Q_{2n}'x$

Date :

S_{2n}:

$Q_{1n}Q_{2n}$ \ x	0	1
00	1	1
01	X	X
11	0	0
10	1	0

$S_{2n} = Q_{1n}'$

R_{2n}:

$Q_{1n}Q_{2n}$ \ x	0	1
00	0	0
01	0	0
11	1	1
10	X	X

$R_{2n} = Q_{1n}$

Z_1:

$Q_{1n}Q_{2n}$ \ x	0	1
00	1	0
01	0	1
11	1	1
10	0	1

$Z_1 = Q_{1n}Q_{2n} + Q_{1n}x + Q_{2n}x + Q_{1n}'Q_{2n}'x'$

Z_2:

$Q_{1n}Q_{2n}$ \ x	0	1
00	1	0
01	0	1
11	0	0
10	1	0

$Z_2 = Q_{2n}'x' + Q_{2n}'Q_{1n}$