

1A)

For output B:-

$\overline{In3} \overline{In2}$ \ $In1 \overline{In0}$	00	01	11	10	
00	1	1	1	1	$\overline{In3} \overline{In2}$
01	1	0	1	0	
11	0	1	0	0	$\overline{In2} \overline{In0}$
$\overline{In3} \overline{In1} \overline{In0}$ 10	1	1	0	1	$\overline{In3} \overline{In1} \overline{In0}$

$$B = \overline{In3} \overline{In1} \overline{In2} + \overline{In3} \overline{In1} \overline{In0} + \overline{In3} \overline{In2} + \overline{In2} \overline{In0}$$

For output C:-

$\overline{In3} \overline{In2}$ \ $In1 \overline{In0}$	00	01	11	10	
00	1	1	1	0	$\overline{In3} \overline{In1} \overline{In0}$
01	1	1	1	1	$\overline{In1} \overline{In0}$
11	0	1	0	0	$\overline{In3} \overline{In2}$
10	1	1	1	1	$\overline{In3} \overline{In2}$

$$\therefore C = \overline{In3} \overline{In1} \overline{In0} + \overline{In3} \overline{In2} + \overline{In1} \overline{In0} + \overline{In3} \overline{In2} + \overline{In3} \overline{In2}$$

(1)

Ans 1.10)

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Output for A:-

		$\overline{\ln 3} \ln 2 \ln 0$			
		$\ln 1 \ln 0$	01	11	10
$\ln 3 \ln 2$	00	1	0	1	1
	01	0	1	1	1
	11	1	0	1	1
	10	1	1	0	1

$\overline{\ln 3} \ln 1$
 $\ln 2 \ln 1$
 $\ln 2 \ln 0$
 $\ln 3 \overline{\ln 1} \ln 0$
 $\ln 3 \overline{\ln 2} \ln 1$

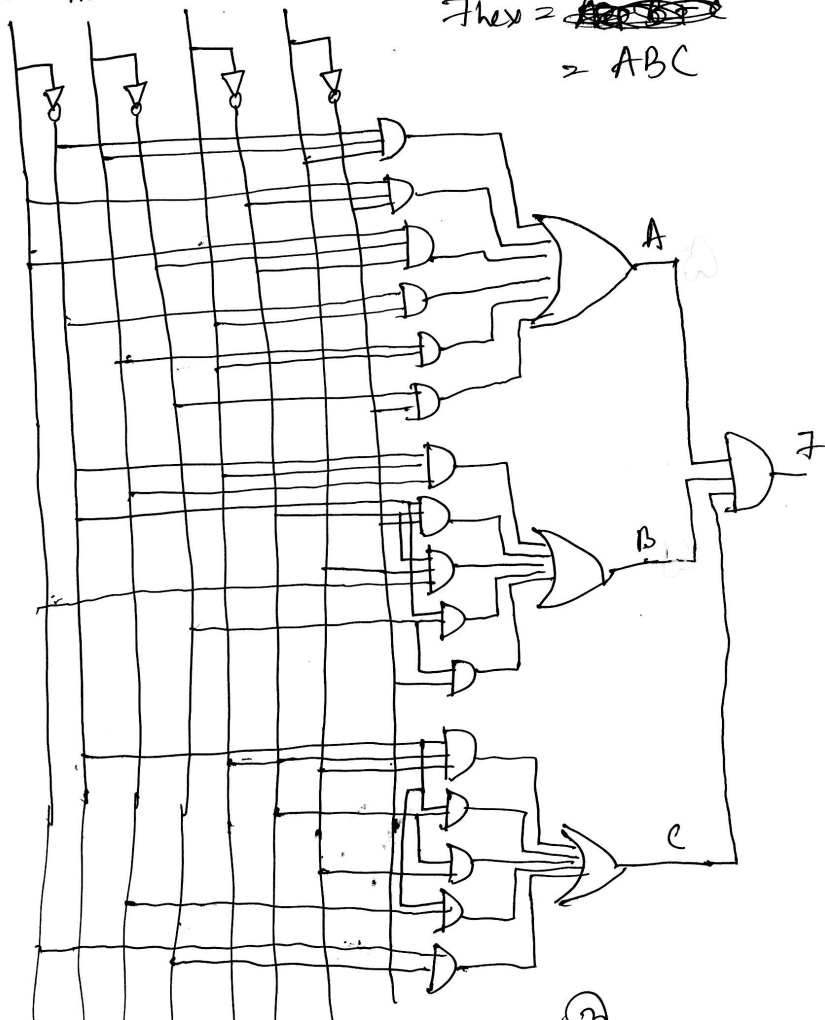
$$A = \overline{\ln 3} \ln 2 \ln 0 + \ln 3 \overline{\ln 1} \ln 0 + \ln 3 \overline{\ln 2} \ln 1 + \ln 3 \ln 1 + \ln 2 \ln 1 + \ln 2 \ln 0$$

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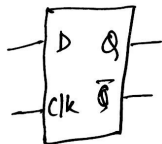
Ans 1. B)

in3 in2 in1 in0

Then = ~~ABC~~
= ABC



Ans 2. A) D latch is a level triggered element and it copies value of D to Q when clock = 1 for positive level triggered D-latch, and clock = 0 for negative level triggered D-latch. Moreover, latches are asynchronous, that means the output changes as soon as input changes.



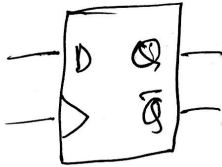
D latch.

On the other hand, D flip flop is edge triggered element. That is it sets $Q = D$ at all rising edge of the clock for positive edge triggered D flip flop and sets $Q = D$ at all falling edges of the clock for negative edge triggered D flip flop. D flip flops are

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Ans 2A)

synchronous, which means the value changes after some time the edge rises or falls.

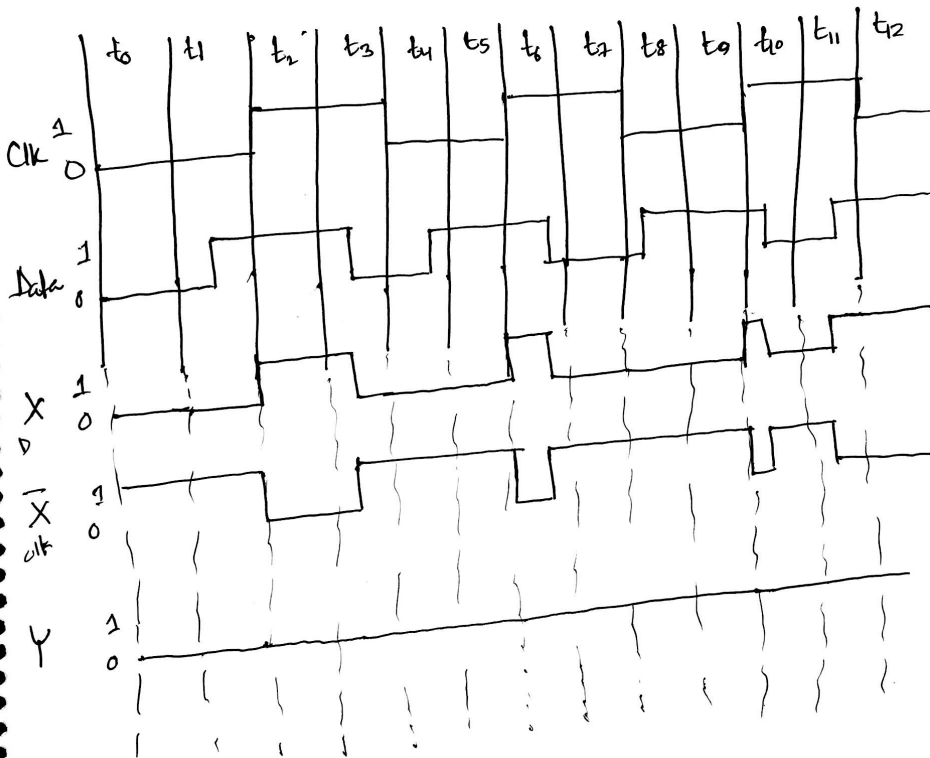


Positive edge triggered D flip flop.

→ p.t.o

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Ans)
2B



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3 A). One hot encoding is advantageous to use when there are a number of states many states. One hot encoding makes it easy to detect which bit belongs to what and is also cost effective. Therefore, if there are 4 states, there will be 4 bits w, x, y, z and if $y=1$ we can easily say it is indicating state B.

A \rightarrow 0001

B \rightarrow 0010

C \rightarrow 0100

D \rightarrow 1000

(7)

3B)

State transition diagram:-

Present state	w=00	w=01	w=10	w=11	w=00	01	10	11
A	A	B	A	A	001	001	001	001
B	C	C	A	A	111	111	111	111
C	B	B	B	B	010	010	010	010

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Ans 3. b) State Assigned table:-

Present state $y_3 y_2 y_1$	Next state					Output			
	$w=00$ $y_3 y_2 y_1$	$w=01$ $y_3 y_2 y_1$	$w=10$ $y_3 y_2 y_1$	$w=11$ $y_3 y_2 y_1$	$w=00$ $y_3 y_2 y_1$	$w=01$ $y_3 y_2 y_1$	$w=10$ $y_3 y_2 y_1$	$w=11$ $y_3 y_2 y_1$	
A 0 0 1	00 1	0 1 0	00 1	00 1	00 1	00 1	00 1	00 1	00 1
B 0 1 0	1 0 0	1 0 0	00 1	00 1	1 1 1	1 1 1	1 1 1	1 1 1	1 1 1
C 1 0 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0	0 1 0

Ans 3 c)

w	00	01	11	10
$y_3 y_2$				
00	0	0	0	0
01	0	0	0	0
11	0	0	0	0
10	0	0	0	0

$y_3 =$ ~~0~~ ~~0~~ ~~0~~ $y_3' y_2$

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Q

3.c). $y_2 y_1$

$y_2 y_1$	00	01	11	10
00	0	0	0	0
01	1	1	1	1
11	d	d	1	d
10	d	d	d	d

y_1

$$\therefore Y_3 = y_3' y_2$$

$$\Rightarrow Z_2 = y_3' y_1$$

(10)