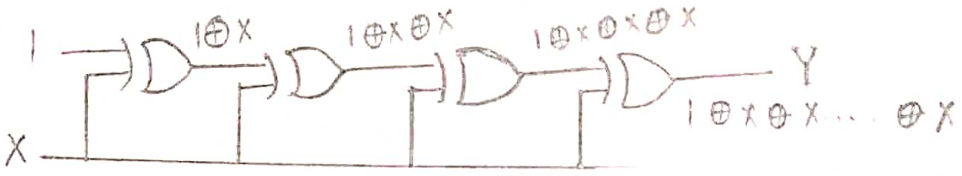
NAME: SEEMI KUMARI REG NO: 2141011163 BRANCH: CSE 'B'

COA ASSIGNMENT: 03

SNO: 27

Q1.

Ans



$Y = 1 \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X \oplus X$

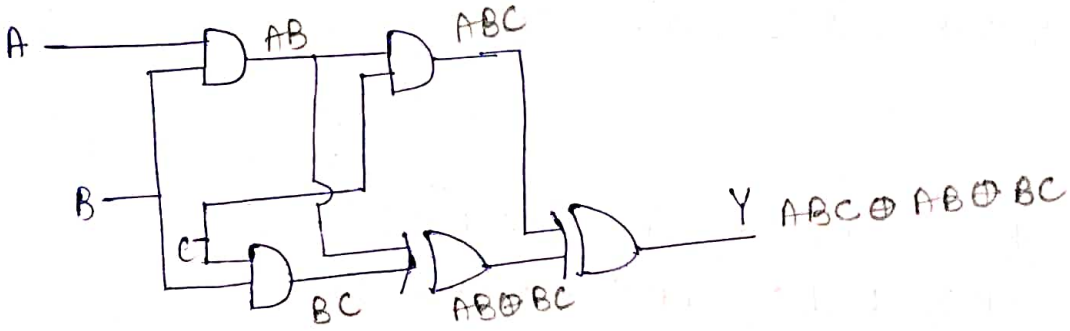
$Y = 1 \oplus 0 \oplus 0$

$= 1 \oplus 0$.

b] $Y = 1$.

Q2.

Ans.



$Y = ABC \oplus AB \oplus BC$

$= AB(C \oplus 1) \oplus BC$

$= AB\bar{C} \oplus BC$

$= B(A\bar{C} \oplus C)$

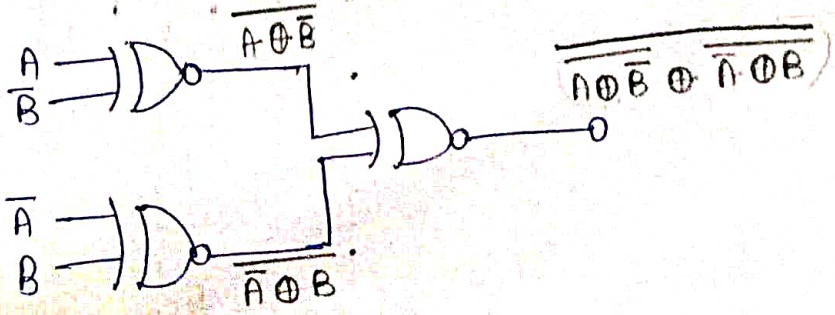
$= B[\overline{A\bar{C}}\,C + A\bar{C}\cdot\bar{C}]$

$= B[(\bar{A}+C)C + A\bar{C}]$

$= B[\bar{A}C + C + A\bar{C}]$

$= B[C + A\bar{C}] = B[C+A]$ option(C).

Q3.

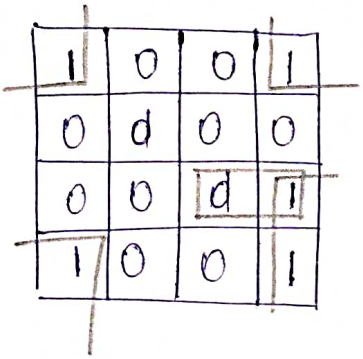


$$Y = \overline{\overline{A \oplus \overline{B}} \oplus \overline{\overline{A} \oplus B}}$$

$$Y = \overline{A \oplus \overline{B}} \oplus \overline{\overline{A} \oplus B}$$

Q4.

Ans.



NO. of minimized sum of product = 2.

$$f(a,b,c,d) = b'd' + ac\bar{d}$$

Q5

Ans.

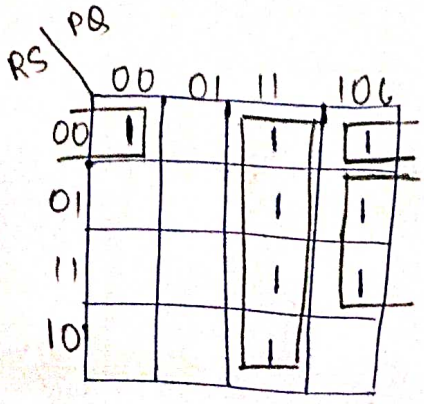
$$Z = RSI_3 + R\bar{S}I_2 + \bar{R}SI_1 + \bar{R}\bar{S}I_0$$
$$= PRS + PQR\bar{S} + P\bar{R}S + (P + \bar{Q})\bar{R}\bar{S}$$
$$= PRS + PQR\bar{S} + P\bar{R}S + P\bar{R}\bar{S} + \overline{QRS}$$

$$PRS(Q + \bar{Q}) = PRSQ + PQ\bar{R}S$$
$$P\bar{R}S(Q + \bar{Q}) = PQ\bar{R}S + P\overline{QR}S$$
$$P\bar{R}\bar{S}(Q + \bar{Q}) = PQ\bar{R}\bar{S} + P\overline{QRS}$$
$$\overline{QRS}(P + \bar{P}) = P\overline{QRS} + \overline{PQRS}$$

$$Z = PQR\bar{S} + PQRS + P\bar{Q}RS + PQ\bar{R}S + P\bar{Q}\bar{R}S + PQ\bar{R}\bar{S} + P\overline{QRS} + \overline{PQRS}$$

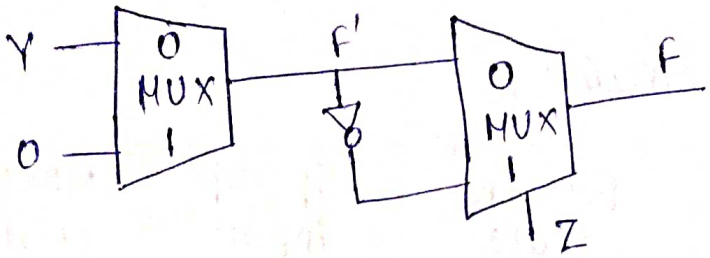
So, by k-map

(a) $Z = PQ + P\bar{Q}S + \bar{Q}\bar{R}\bar{S}$



Q6.

Ans.



$F' = \bar{x}y + x \cdot 0$

$F' = \bar{x}y$

and $F = \bar{z}F' + zF'$

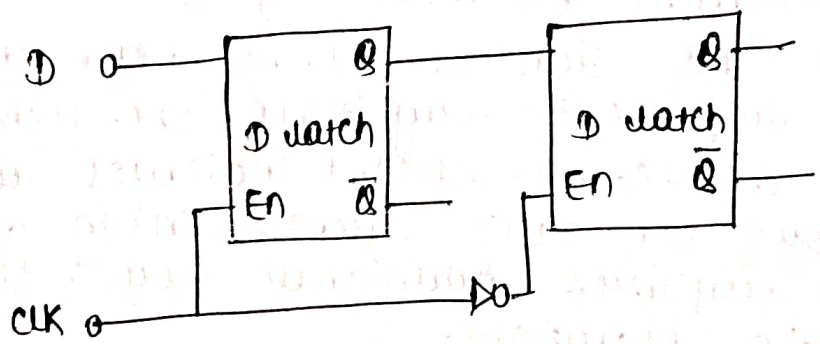
$= \bar{z}(\bar{x} \cdot y) + z\overline{(\bar{x} \cdot y)}$

$= \bar{x}y\bar{z} + z(x + \bar{y})$

b] $F = \bar{x}y\bar{z} + xz + \bar{y}z$

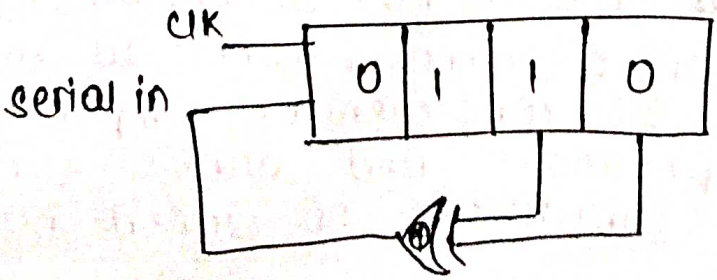
Q7. Ans [C] $\bar{P}Q\bar{R} + \bar{P}QR + P\bar{Q}R$

Q8.



Ans [d] Master-slave D flip-flop.

Q9



Ans

CLK	Q_0	Q_1	Q_2	Q_3
0	0	1	1	0
1	1	0	1	1
2	0	1	0	1
3	1	0	1	0

$Q_0 = Q_2 \oplus Q_3$

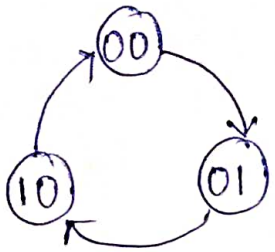
[C] 1010.

Q10

Ans. From the given circuit;

$D_1 = Q_0$

$D_0 = \overline{Q_1 + Q_0}$



Present state		Flipflop inputs		Next state	
Q_1	Q_0	D_1	D_0	Q_1^+	Q_0^+
0	0	0	1	0	1
0	1	1	0	1	0
1	0	0	0	0	0

[b] 00, 01, 10, 00, 01

Q11.

Ans. 1. Sign magnitude: The most significant bit (MSB) represents the sign of the number, and the rest bit represent magnitude. The MSB of 0 indicates a +ve no. while 1 indicates a -ve no. This allows for easy identification of the sign but requires additional logic for arithmetic operations.

2. Two's complement: used for signed integers. The MSB is the sign bit, with 0 indicating a +ve no. and 1 = -ve no. To obtain the 2's complement of a -ve no., invert all the bits and add 1. 2's complement simplifies arithmetic operations and allows for easy addition and substraction of signed no.

3. Biased: It involves addition a bias or offset value to the actual data. The bias is typically added to the exponent field in floating point representation to allow a wider range of +ve and -ve exponents. It ensures that the representation is always +ve, simplifying comparison and sorting operations.

Q12

Ans. To compute $P = x \times y$ using Booth's algorithm,

1. Initialise P and Q with the value of x and y in 2's complement notation.

   P = 00000000 00000101
   Q = 11111111 11111010

2. Create an auxiliary register (AC) initialized with 0.

   AC = 00000000 00000000

3. Perform iterations:

   → If the LSB of Q and the previous LSB of Q (Q_0 and Q_{-1}) are 01 or 10, arithmetic right shift of P and AC, and add x to P.

   → If Q_0 and Q_{-1} are 00 and 11, arithmetic right shift of P and AC, and subtract x from P.

Iteration 1: $Q_0 = 0$ $Q_{-1} = 0$, shift P and AC right

   P: 00000000 00000010
   AC: " 00000000

Iteration 2: $Q_0 = 1$ $Q_{-1} = 0$ shift P and AC right. Add x to P.

   P: 10000000 00000001
   AC: 00000000 00000000

Iteration 3: $Q_0 = 1$ $Q_{-1} = 1$ shift P and AC right + x to P.

   P: 11000000 00000000
   AC: 00000000 "

Iteration 4: $Q_0 = 0$ $Q_{-1} = 1$ shift P and AC right. subtract x from P.

   P: 11100000 00000000
   AC: 00000000 "

Iteration 5: $Q_0 = 0$ $Q_{-1} = 0$ shift P and AC right.

   P: 11110000 00000000
   AC: 00000000 "

Iteration 6: $Q_0 = 0$ $Q_{-1} = 0$ shift P and AC right

P: 11111000 00000000

AC: 00000000 "

Iteration 7: $Q_0 = 1$ $Q_{-1} = 0$ shift P and AC right
add x to P.

P: 11111100 00000001

AC: 00000000 00000000

4. The final value of P is the product P.

P: 11111100 00000001 $\Rightarrow P = x \times y$ is
-90 in 2's complement.

Q13.

Ans a] b+13

b = 00000110

13 = 00001101

sum: 19 = 00010011

b] -b+13

-b = 11111010

13 = 00001101

sum: 7 = 00000111

c] b-13

b = 00000110

13 = 00001101

diff = 11111011 (-7)

d] -b-13

-b = 11111010

-13 = 00001101

diff = 11101101 (-19)

Q14.

Ans. a]

```
  111000        111000
- 110011      + 001101   => 2's complement
--------      --------
  000101 <-  [1]000101
              X
```

b]

```
  11001100      11001100
- 00101110    + 11010010   => 2's complement
----------    ----------
  10011110 <- [1]10011110
               X
```

c] 1111000011111 − 1100111100011 = 0010000011100

1111000011111 + 0011000011100 ⇒ 2's.

0010000011100 ← 1 0010000011100

(1 is the X)

d] 11000011 − 11101000 = −00100101

11000011 + 00010111 = 11011011

2's comp

−ve sign in front (no end carry).

Q15.

Ans 72530 − 13250 using 10's complement:

10's complement of 72530 = 27470

" " " 13250 = 86750

27470 + 86750 = 114220

- Check if there is an end-around carry (carry-out) in the result:
in case, there's no end-around carry.

10's complement of 114220 = 885,780

Add a −ve sign do the result to indicate subtraction:

∴ 72530 − 13250 = −885780.