

# I N D E X

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ROLLNO.: 16MA20003

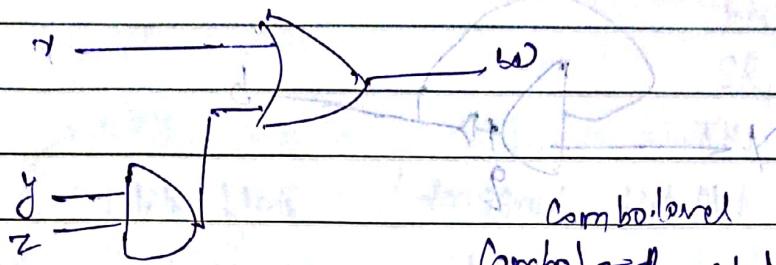
STD.: \_\_\_\_\_ DIV./ SEC.: \_\_\_\_\_ SUBJECT: \_\_\_\_\_

Date 17, 07, 18

Saathi

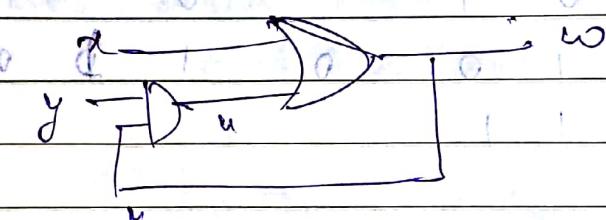
Mand

$$x \div y = \frac{x}{y} \quad (x, y \neq 0)$$



Combinational ckt with 3 inputs

## Sequential circuit



$\text{d}x/dt = \omega_0 \sin(\omega_0 t)$   $\Rightarrow x(t) = -\frac{\omega_0}{\omega_0^2} \cos(\omega_0 t) + C$

if  $y=1 \rightarrow \text{unc}$

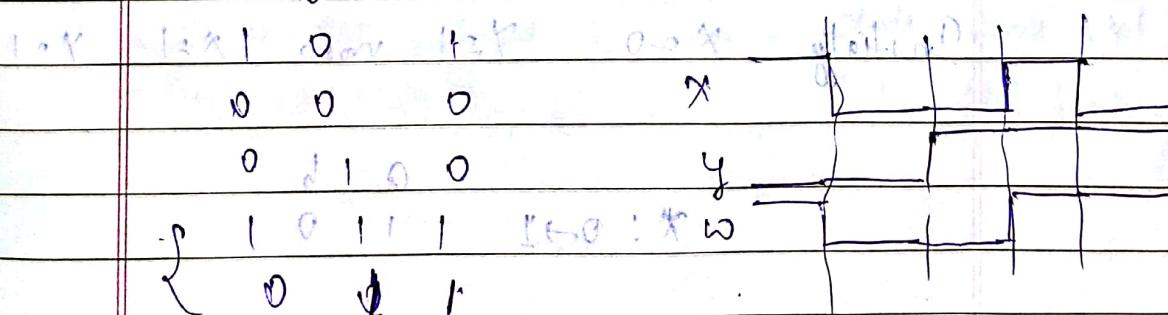
1 1 ✓ 12.8 N 5 k 12

10 0 0 0 ✓

$\text{O}_2$  remains in the same

→ remain the bottle.

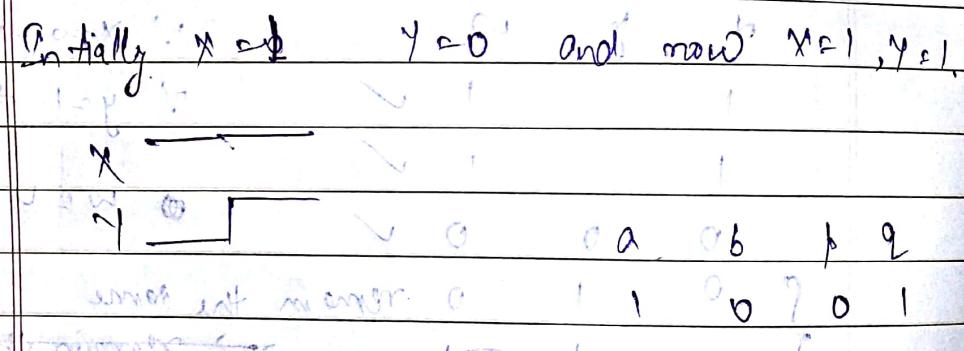
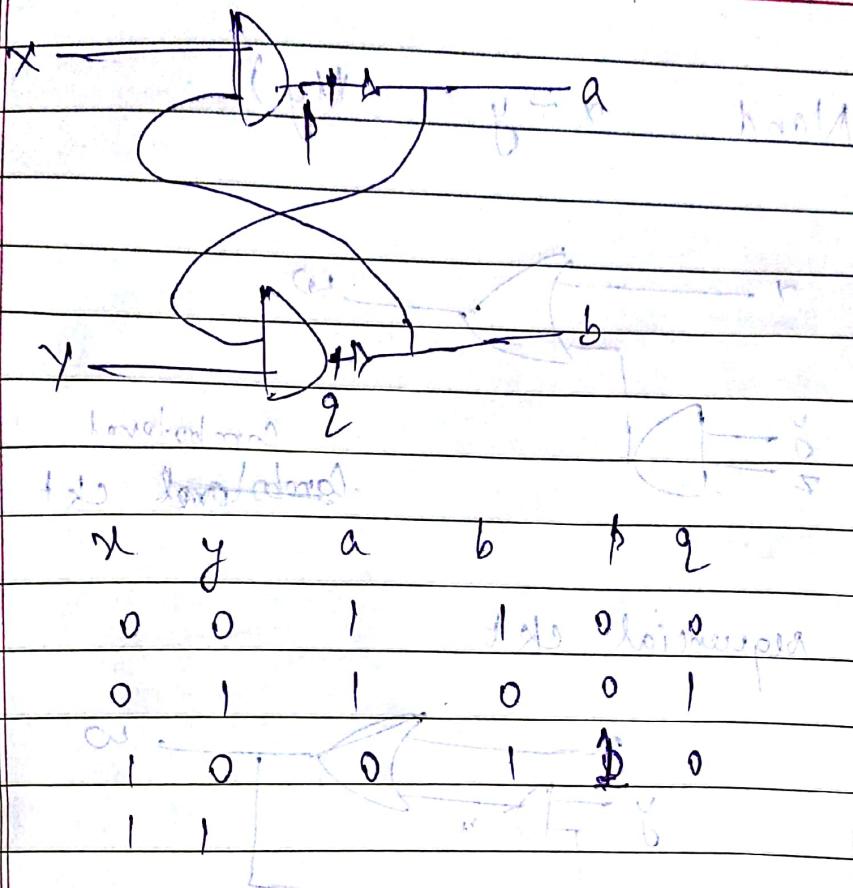
$x \ y \ w$



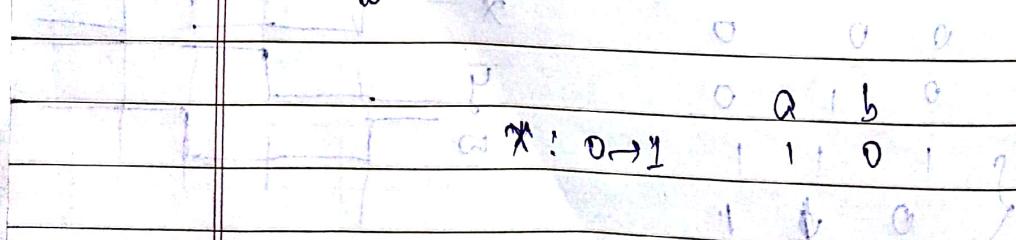
Date 17/07/18

8' Pg m

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Initially  $x=0, y=1$  and now  $x=1, y=1$ .



# Digital components

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Date 23/07/18

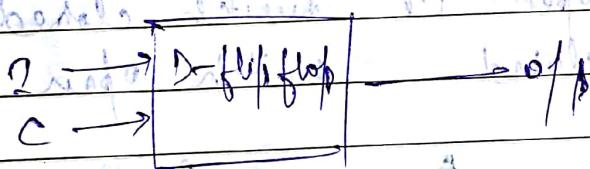
Output depends on input only → Combination  
on input/output → Sequential

↑  
flip flop  
SR

→ delay between inputs & outputs in JK flip flop  
of J-K flip flop / triggered flip flop  
two inputs are output

- ① data
- ② clock.

When clock  $1 \rightarrow 0$  → what?  
output in data.



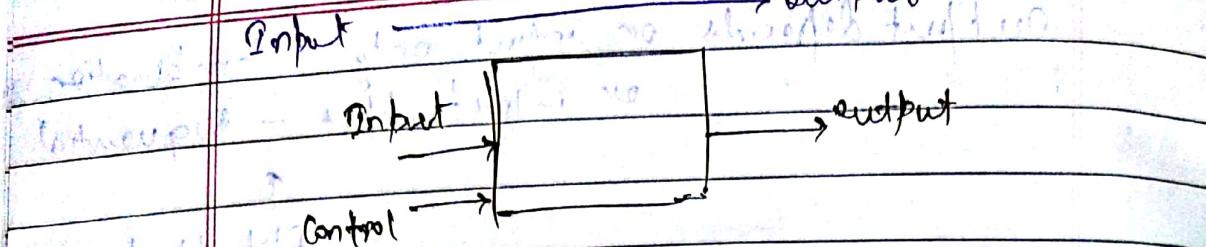
When clock  $1 \rightarrow 0$  output is input  
otherwise output is unchanged.

63 → 41 → 31 → 84 → 69 → 100

What next, the input of the previous flip flop  
will be the output of current whole time & lot.  
This is Delay flip flop. (D flip flop).

# Saathi

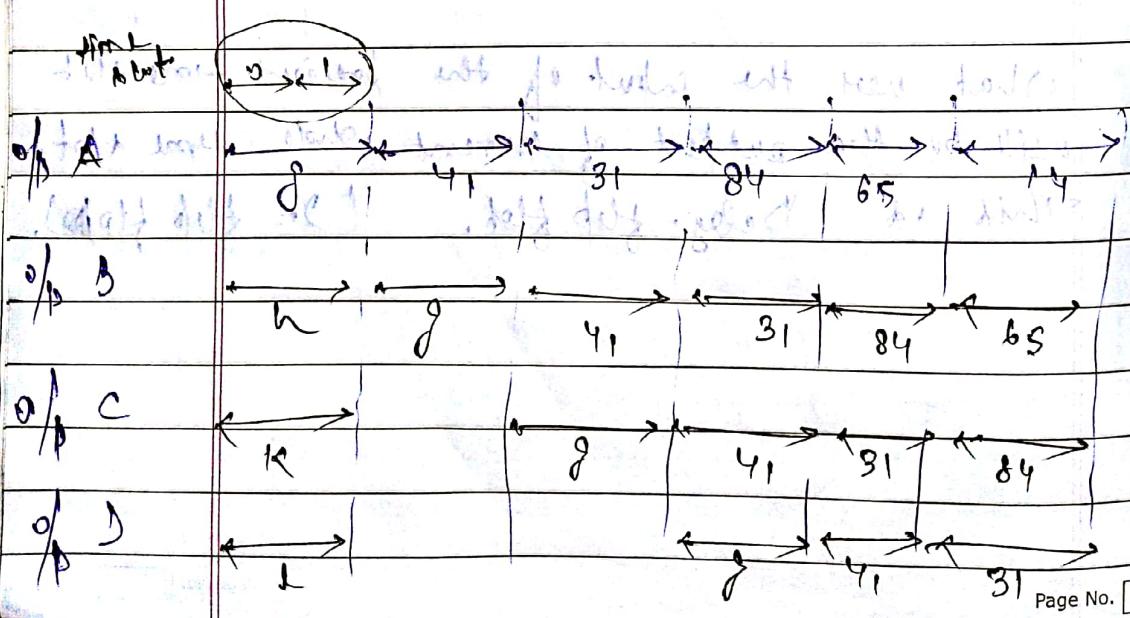
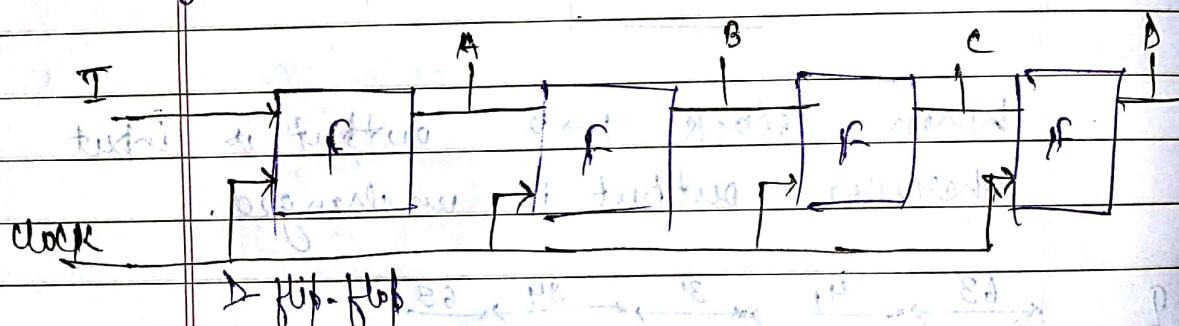
Date \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_



If gate is opened input goes to output.  
if gate is closed input doesn't go to output.

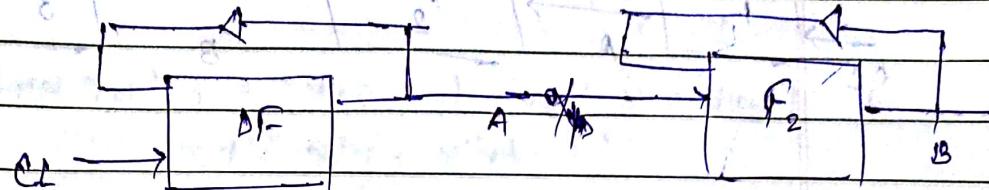
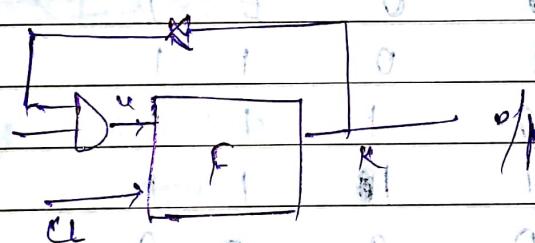
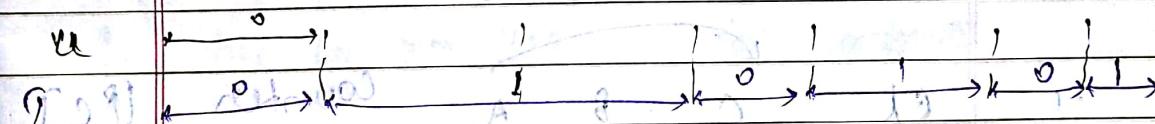
Input → ~~gate is closed~~ makes output.

gate open i.e. switch closed.  
gate closed switch open?

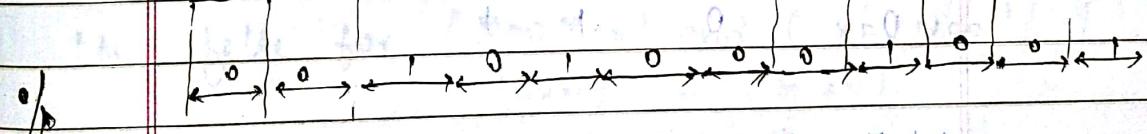


Date 23/07/18

This is shift register.

~~Ex 2~~~~Ex 3~~~~Q39~~

CL



Next, write all digits missing in method stated

x. x 12P 12X (1)

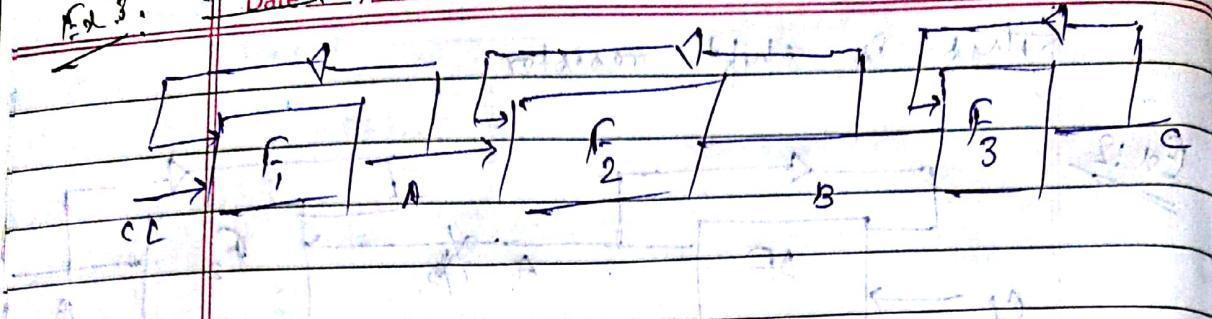
12X (12P, 12X) b/w (12P, 12X) (2)

x. x 12P 12X (2)

\* when  $C \rightarrow 0$   $D/P$  is  $E/P$

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Ex 3. Counter Date



CL A B C

Let 0 0 1 0

L 0 1 0

0 1 0 0

1 1 0 0

0 0 0 1

1 0 0 0

0 1 0 1

1 1 0 1

0 0 1 1

1 0 1 1

0 1 1 1

1 1 1 1

0 0 0 0

CL C B A Counter (PC)

Let 0 0 1 0  $ir = [PC+J]$

1 0 1 0

0 0 1 1

Write boolean expression which is true when

①  $x=1 \quad y=1 \quad x \cdot y$

②  $(x=1 \quad y=1) \text{ and } (x=0 \quad y=0) \quad x \oplus y$

③  $x=0 \quad y=1 \quad x' \cdot y$

$$P + Q \cdot R = (P+Q)(P+R)$$

Date 24/07/18

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4.  $(X \neq Y) \text{ and } (X \neq Y')$

$$\text{both } X \neq Y \text{ and } X \neq Y' \Rightarrow (X \neq X') \cdot Y$$

$$X \neq X' \cdot Y \Rightarrow X \neq Y$$

5.  $(X \neq Y) \text{ and } (X \neq Y')$  and  $(X \neq 0 \cdot Y \neq 0)$

$$X \neq Y + X' \neq Y' + X' \neq 0 \cdot Y \neq 0$$

$$= \cancel{X \neq Y} \cdot X \neq Y + X' \neq Y + X' \neq 0 \cdot Y \neq 0$$

$$= Y + X' \neq Y + X' \neq 0 \cdot Y \neq 0$$

6. Design an expression which is false when

$$X=1 \cdot Y=0, \quad 98+99+9=?$$

$$(X \neq Y)' \cdot (98+99+9) \neq 0$$

$$= X' + Y + 98+99+9 \neq 0$$

7. false for  $(X \neq Y \neq 0)$  and  $(X=0 \cdot Y=1)$

$$(X \neq Y)' + (Y \neq 1)' \cdot (X \neq Y) \cdot (X \neq Y)$$

$$= \cancel{(X \neq Y \cdot X \neq Y)}'$$

8. false for  $X \neq Y \neq 0$

$$= \cancel{X \neq Y} \cdot X+Y$$

9. true for  $X \neq Y \neq 0$  by  $X \neq Y \Rightarrow X \neq Y$

10. false for  $X \neq Y \neq 0$  by  $(X \neq Y)' \neq (X \neq Y) \text{ and } (Y \neq 0) \neq Y$

$$(X \neq Y)' \neq (X \neq Y) \text{ and } (Y \neq 0) \neq Y$$

11. false for  $(X \neq Y \neq 0)$  and  $(X=1 \cdot Y \neq 0)$

$$(X \neq Y) \dots (X \neq Y)$$

$$= X \neq Y + X \neq Y + X \neq Y + X \neq Y$$

$$= Y$$

$$(a+b)(c+d) = ac + bd + bc + ad$$

Date \_\_\_\_\_

2. Prove  $(a+c)(a+d)(b+c)(b+d) = ab + cd$

3.  $(a+c)(b+d)(a+d) = ab + cd + ad$

4.  $(a+d)(a+d) = a^2d + a^2c$

5. Prove  $a(P+QR) = (P+Q)(P+R)$  from  
 $P(Q+R) = PA + PR$

Soln.  $(P+Q)(P+R) =$

$$PP + PR + PQ + QR$$

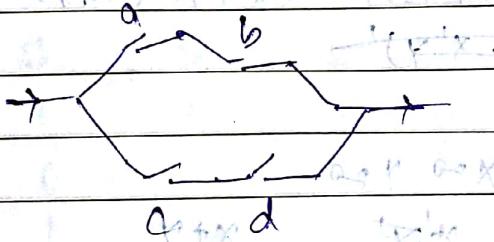
~~cancel P + PR + PR + QR~~

$$= P + PR + QR$$

$$= P + QR.$$

6.  $(a+b)(b+d)(b+c)(b+d) = ab + cd$

(fix x) (fix x) (fix x) (fix x)



Sum of sufficient condition for current flow

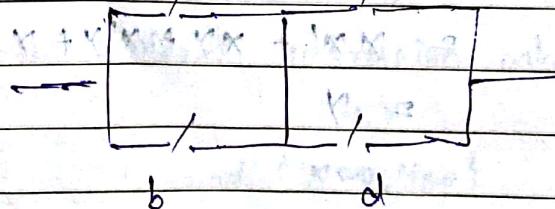
~~sum ab + cd~~ ~~only PQR ref int~~

Product of necessary cond'n for current flow

$$(a+c)(a+d)(b+c)(b+d)$$

(fix x) (fix x) (fix x) (fix x) ref gal

1.  $(a+b)(c+d)$

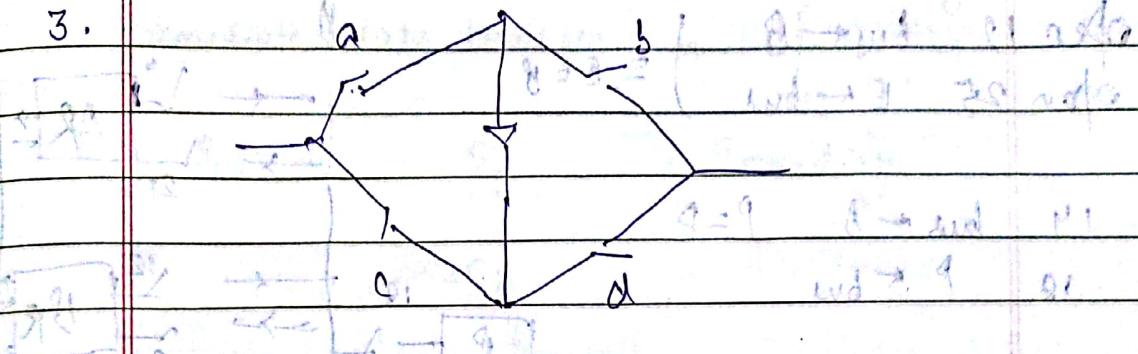


$$ac + bd + ad + bc \underset{\text{ref gal}}{=} (a+b)(c+d)$$

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Date \_\_\_\_\_

3.



sufficient.

necessary

$$ab + cd \neq abd + ad + bc$$

$$(a+c)(b+d) \neq ab + cd$$

$$(a+d)(a+c)(b+d) = (ab + ad + bc + dc)(a+d)$$

$$\Leftrightarrow ab + ad + bc + dc + ab + ad + bc + dc + ad + cd$$

$$\Leftrightarrow ab + ad + bc + cd + ad + cd + bc + ad + cd$$

$$\Leftrightarrow ab + ad + bc + cd$$

$$\Leftrightarrow ab + ad + bc + cd$$

$$\Leftrightarrow ab + ad + bc + cd$$

$$\Leftrightarrow ab + cd + ad$$

(but  $a \neq 0$ )

$$3+3+3=12$$

$$3+3=6$$

$$3+3+3=12$$

$$3+3=6$$

$$3+3+3=12$$

$$3+3=6$$

$$3+3+3=12$$

$$3+3=6$$

$$3+3+3=12$$

$$3+3=6$$

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$$3+3=6$$

$$3+3+3=12$$

$$3+3=6$$

$$3+3+3=12$$

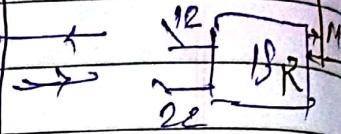
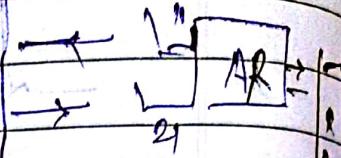
$$3+3=6$$

Date / /

$$\begin{array}{l} \text{open } 12 \text{ bus} \leftarrow B \\ \text{open } 25 \text{ E} \leftarrow \text{bus} \end{array} \quad ] \quad E, E = 8$$

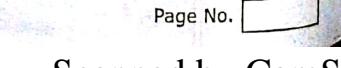
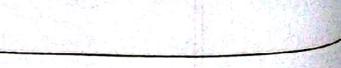
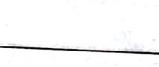
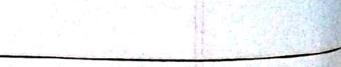
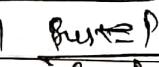
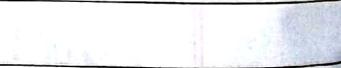
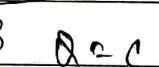
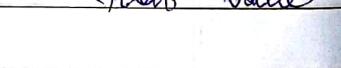
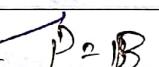
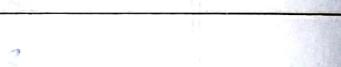
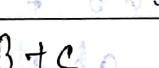
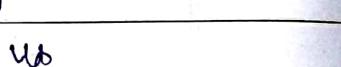
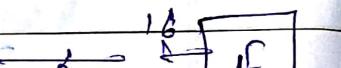
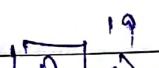
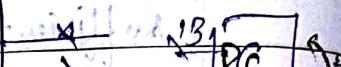
$$14 \text{ bus} \leftarrow D \quad P = D$$

$$18 \quad P \leftarrow \text{bus}$$



$$D = P \text{ and } E = 10$$

(B + D) (possible)



$$B = D \times F + 3d_0; \quad E = B + C_0 \quad \text{(already has this value)}$$

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# Saathi

## Addressing modes

Date 30/07/18

Intermediate data transfer

Bus  $\leftarrow$  S3  
19

S8  
18  
33

22  $\rightarrow$  direct.

63  $\rightarrow$  indirect. if C = 5

then Bus  $\leftarrow$  [C33]  
ie [53]

A. Read a number and print it by multiplying by 2. after each loop increment C by 1

→ 41 Inputs from user  
18 P  $\leftarrow$  Bus  
52 Bus  $\leftarrow$  2  
19 A  $\leftarrow$  Bus  
33 Bus  $\leftarrow$  P \* A  
42 Bus  $\leftarrow$  Output.

B.  $3 * 8 + 7 * 6$

153 Bus  $\leftarrow$  3  
18 P  $\leftarrow$  Bus  
28 Bus  $\leftarrow$  8  
19 A  $\leftarrow$  Bus  
33 Bus  $\leftarrow$  P \* Q  
24 18 = P \* Q  
 $P = 3$   
 $Q = 6$   
 $A = 18$   
 $Q = P * Q$

MAR  
MBR

D  $\rightarrow$  MR

I  $\rightarrow$  MR

Saathi

Date: 1-1-14

12 ) P  $\leftarrow$  D. refresh state & strobe P  
18

18  $\rightarrow$  P  $\rightarrow$  P  $\rightarrow$  P

3)  $P + Q^2 \rightarrow$  output

0	1	2	3	4	5	6	7	8	9
54	21	0	12	42					

bus A  $\rightarrow$  MAR

bus I  $\rightarrow$  MBR

54 A = 20 if third bit no reference to board A

0 0  $\rightarrow$  memory read operation.  
i.e. MBR  $\leftarrow$  [MAR]

A = bus ~~RAM~~ 1 8

12 Bus  $\leftarrow$  8 = W $\rightarrow$  8 = P

42 point R $\rightarrow$  W $\rightarrow$  P

0/P is  $\rightarrow$  21  $\rightarrow$  P

54	85	21	73	87	94	0	1	12	42
----	----	----	----	----	----	---	---	----	----

NOP NOP W $\rightarrow$  P P

Bus = 4 P Bus P MBR

A  $\leftarrow$  Bus = R $\rightarrow$  W $\rightarrow$  P

MBR  $\leftarrow$  [MAR]

(A) i.e. 87

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2R → 2 instruction resistor

39 bytes

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Date 30/07/18

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
59	21	533	22	1	57	18	53	19	32	40	504	23				

MAR = 9

MBR = 33

(9) ← 33

(MAR) ← MBR

32 → 33

→ o/p = 4

$$\begin{aligned} \text{o/p} &= 7 * 3 \\ &= 21 \end{aligned}$$

0	1	2	3	4
84	21	0	10	42

A = 4 MR = print(B)

o/p is 42

not garbage.

8

502	23	507	25	18	42	13	42	21	42	value of
PC = 2	R = 7	Print(B)	o/p = 2	o/p = 7	PC is incremented					

506	23	587	42	511	42	517	42	21	42	17
PC = 6	Execution from A.									

By Paridhi

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502  
PC

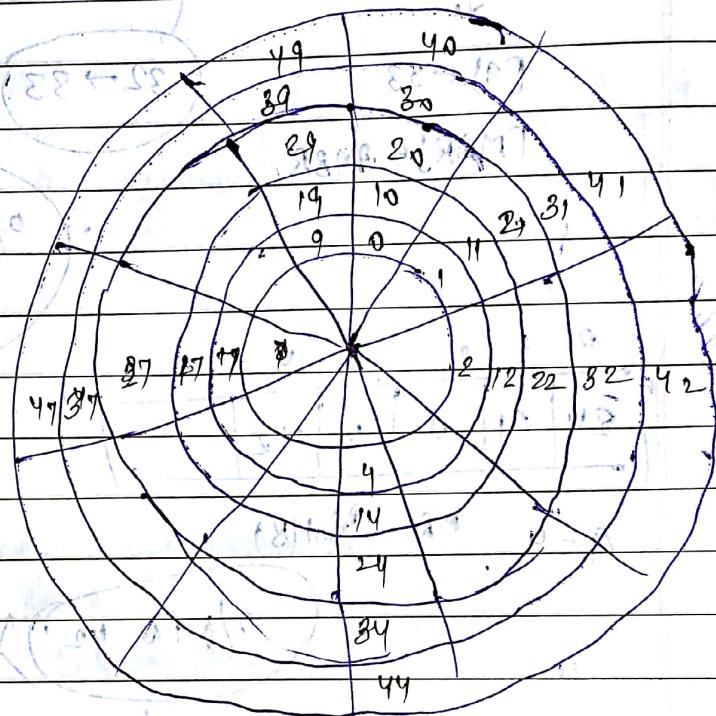
zero means PC

Date 1/1/

Saathi

Q. 517, 19, 41, 18, 33, 2121, 802, + 23  
P.E = 2

R = 217 Input  $\Rightarrow P_8$  Output  $\Rightarrow P_8 = 17$  \* input.  
infinite loop.



Disk 50 unit of data.

Head can move in radial direction at. wish.

Disk rotated always

10 unit time / revolution  $\rightarrow$  Disk

Head 3 unit / track

Let at  $t=0$ , Head is at memory 20  
 $t=3$  it can be 28, 33, 18,

Memory offset

Page No. [ ]

# RAID

Date 31/07/18

Saathi

when memory 27 be accessed  $t=7$ .  
 when memory 37 be accessed  $t=7$ .  
 when memory 32 be accessed  $t=8+9=17$

$a = b + c$	5	3	unit time to go
$d = a + [3]$	8+5	3	to next memory
$e = b * c$	5		
$f = e \div [9]$	6+5	5	unit time to
$g = d - [7]$	2+5	7	execute one operation.
$h = f * [1]$	6+5	7	

needs 1 2 3 4 5 6 7 8 9 10 11

m	0	1	2	3	4	5	6	7	8	9	10
m	10	9	8	7	6	5	4	3	2	11	0

if head at T of large disk wait period

head at  $t=0$ .

For Raid

$a = b + c$   $0+5 = 5$   $0+10 = 10$

$d$   $5+5 = 10$   $3$

$e$   $5+5 = 10$   $3$

$f = e \div 9$   $10 \div 9 = 11$   $0+10 = 10$

$g$   $2+5 = 7$   $3$

$h$   $2+5 = 7$   $1$

Redundant array of independent disk

Date 1/1/2023

Ronal

$$(2) = b + c + 1 + 5 + 2 \geq 8 \text{ true}$$

$$p + q + 5 \geq 5 + 2 \text{ true}$$

$$g = p + 12 \geq 5 + 2 \text{ true}$$

$$e = k + t \geq 5 + 7 \text{ true}$$

of all odd terms  $\geq 2 + 4 + 6 + 8 \text{ true}$

of all even terms  $\geq 1 + 3 + 5 + 7 \text{ true}$

of all terms  $\geq 1 + 2 + 3 + 4 + 5 + 6 + 7 \text{ true}$

maximum no. of terms  $\geq 7$  (p + b + p)

$$\{a, b, c, d, e, f, T\} \models p \wedge b \rightarrow p \wedge f$$

numbers a, b, c, d, e. weights

$T$ : cutoff

$a + b + c + d + e \geq T$  if true

if bigger than or equal to  $T$  then true.

$$\theta_1 \{17, -30, 11, 18, 34, 40\}$$

xyzwu  $\geq$  69

$$17 + 0 + 0 + 18 + 34 \geq 69 \geq 40 \text{ true.}$$

xyzwu  $\geq$  69

$$17 + -30 + 11 + 18 + 0 \geq 16 < 40 \text{ false}$$

$$\theta_2 \{-17, 40, 11, 16, 22\}$$

xyzwu  $\geq$  69

[81, 02, 17, 18] 18 + 08 = 09 54 + 08

[08 + 01] 09

**Saathi**

Date 07, 08, 18

Write down boolean exp. for this.

A.  $[14, -28, 24, 10]$

x y z

$x'y'z'$	00.01	11.10	$x'y'z' + xy'z$
$xy'z$	00.10	01.11	$xy'z$
$xyz$	10.01	11.11	$xyz$

$$x'y'z' \leftarrow 10.$$

$$x'y'z' = -28 \times 10 + 11 - 08 = 11$$

$$xy'z = 14 - 28 - 24 \leftarrow 10$$

$$xy'z = 14 + 10 \leftarrow 10$$

$$xyz = 14 - 04 + 11 - 08 + 11 = 10$$

$$\text{answering of } xyz = 14 - 28 + 24 \leftarrow 10 \text{ ab uay}$$

$$xy'z = 14 + 10 \leftarrow 10 \text{ additional}$$

Ques.

For getting threshold  $y + x'zw$

complement of  $y + x'zw$   $\rightarrow [ -17, 11, 18, 22 ]$

For getting threshold

complement of  $(y + x'zw)$   $\rightarrow [ -17, 11, 18, 22 ]$

$$(y + x'zw)'$$
  
$$= y' (x + z' + w')$$

B. Design threshold for

$$x+y$$

$$[10, 12, 8]$$

$$[51, 1, 15]$$

$$x+y'$$

$$[14, -19, -5]$$

$$[51, -1, 03]$$

$$-xy$$

$$[14, 17, 18]$$

$$xy+z$$

$$[4, 14, 20, 18]$$

$$xy'+z$$

$$[-19, -2, 20, 18]$$

$$xy+zw$$

Number of  
minimum mays.  
unknown

Page No.

$xy' + z$  for  $b = 2018$

{18, -1, 20, 18}

$xy'$  for  $b = 18$   
 $a = 18, b = -1$

Saathi

Date 1/1/2018

Q. threshold element for complement of

{17, -30, 11, 18, 34, 40}

we want,

$g(xy \geq 0)$   $\rightarrow 40$  true false

$g(xy \geq 0)$   $\rightarrow 39$  false true.

$g(xy \geq 0)$   $\rightarrow 41$  true false

$\rightarrow 38$  false true.

{-17, 30, -11, -18, -34, -40}

$xy \geq 0$  or  $+0 = 0$

$-17 + 30 - 11 + 0 - 34 = -32 \Rightarrow -40$

You do negation of everything. for getting complement:  $NOT$  = NOT

but at cutoff it will be wrong.

{-17, 11, 18, 40}  $\setminus -40$

$0 \leq -40 \setminus -40$  true. true.

$\Rightarrow f(x, y, z, w, u) + NOT + u$

$\Rightarrow f(x, y, z, w, u) + NOT + u$

$f(x, y, z, w, u) = (xw + yz + u)^{-1}$

$= (xw + yz + u)^{-1}$

ref: blackboard worked . A

(11, 18, 30, 40)

Part 11  $\Rightarrow f(x, y, z, w, u) = (xw + yz + u)^{-1}$

$\Rightarrow f(x, y, z, w, u) = (xw + yz + u)^{-1}$

(11, 18, 30, 40)

1113 N

Date 07, 08, 18

Saathi

Q.  $\begin{array}{c} ab + cd \\ ab \quad cd \end{array}$

~~(1, 2, 17, 18)~~ X.

$a+d$  vs

$d+a$   $\gamma, T$

$b+c$   $\wedge T$

$a \rightarrow b$  38

38  $\rightarrow H$

$B+A \rightarrow H$ .  $C+d \gamma, T$

$a+b+c \wedge T$

$b \wedge c$ .

$d \rightarrow AAM$  II

$d+q$  18

∴ we can't design it.

$d \rightarrow 26$  28

$d+q$  28

$B+q = d$  18

$d+q$  21

$28 + 2AM = 23$  |  $2+d = AAM$

23 | 28 | 13 | 28 | 20 | 18

21 | 28 | 13 | 14 | 28 | 18

$d \rightarrow q$  18

$d \rightarrow d$  28

$d \rightarrow B$  18

$d+q \rightarrow d$  28

$d \rightarrow q$  28

$d \rightarrow d+q$  18

$d \rightarrow q$  18

$d \rightarrow q$  20

$d \rightarrow q$  28

$d \rightarrow q \rightarrow d$  28

$d \rightarrow AAM$  II

Date 12/08/18

## Pipeline

24	25	40	23	24	$i_b \leftarrow D$
31	32	11	32	31	$D \leftarrow i_b$
	35	31		25	$i_b \leftarrow E$
				32	$E \leftarrow i_b$
				35	$K \leftarrow P+Q$
				40	$i_b \leftarrow K$
33	11	35		11	$MAR \leftarrow i_b$
40				31	$P \leftarrow i_b$
				23	$i_b \leftarrow P$
				32	$A \leftarrow i_b$
				33, 40	$i_b = P+Q$
				16	$F = \bar{P}$

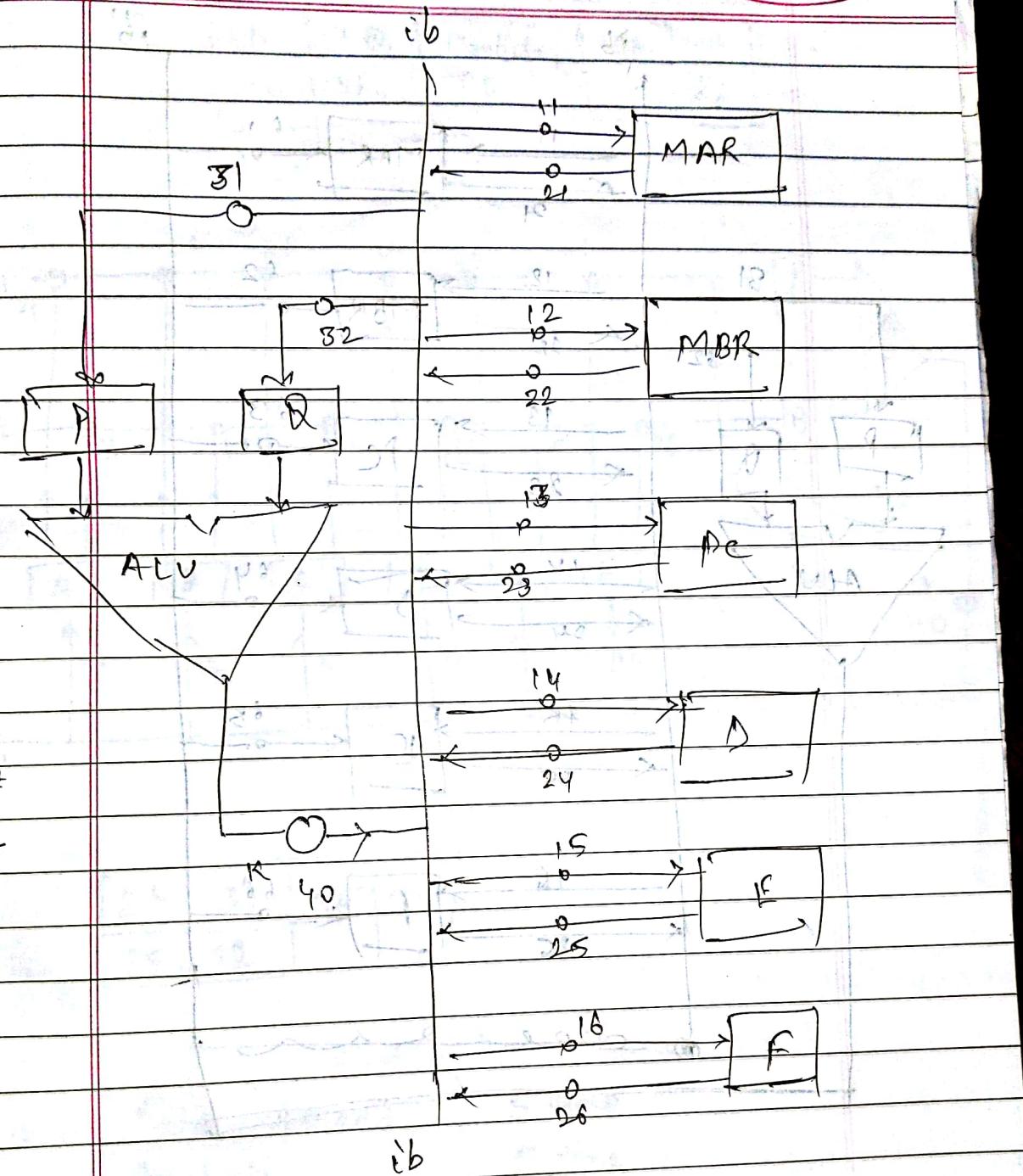
$MAR = D + E$			$F = MAR + PC$		
24	25	35	21	23	33
31	32	11	31	32	16.

24	$i_b \leftarrow D$	31	$P \leftarrow i_b$
31	$P \leftarrow i_b$	23	$i_b \leftarrow P$
25	$i_b \leftarrow E$	32	$A \leftarrow i_b$
32	$A \leftarrow i_b$	33	$i_b \leftarrow P+Q$
35	$i_b \leftarrow P+Q$	46	$P \leftarrow i_b$
11	$MAR \leftarrow i_b$		

FE

Date 1/1/18

Saathi



IF

## Instruction fetch

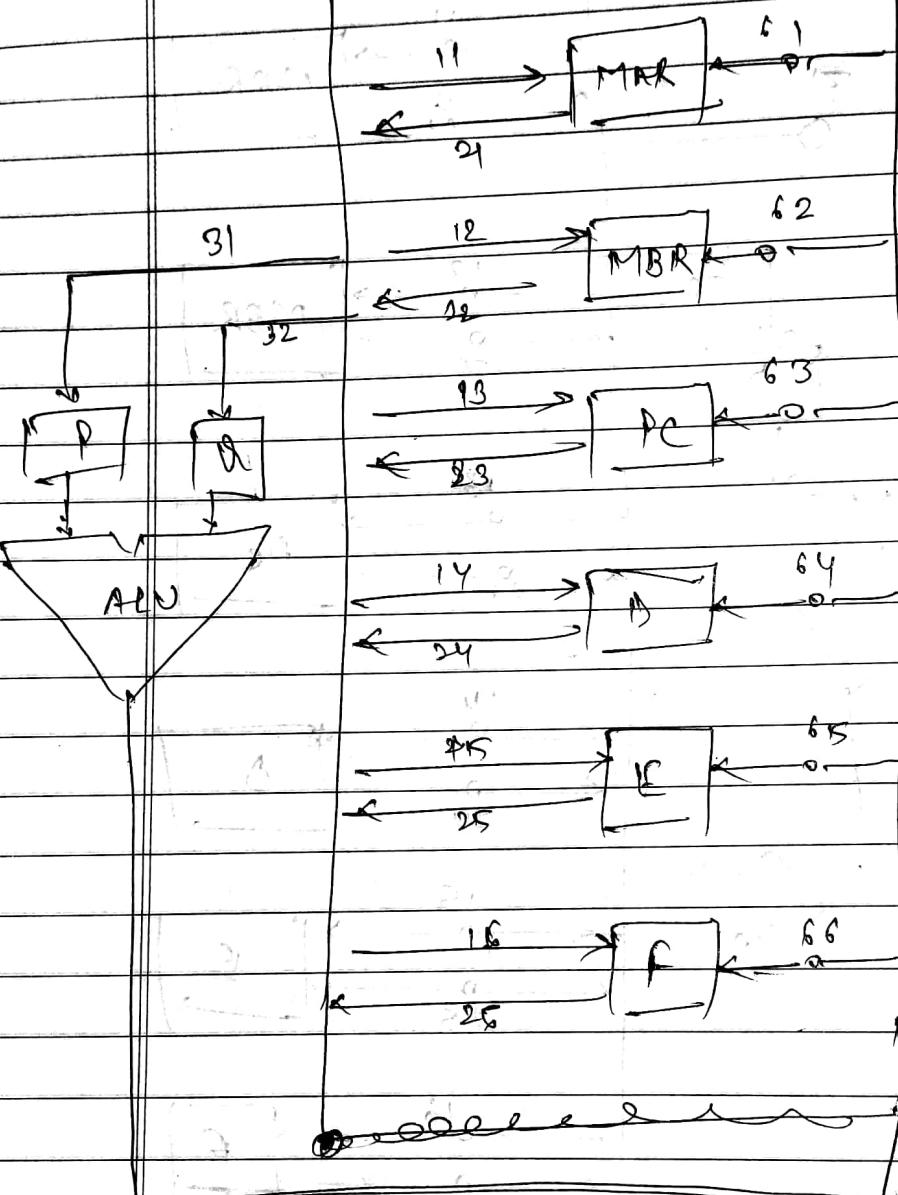
Saathi

Date / /

Date 13

ib

ib'



24

25

31

32

35

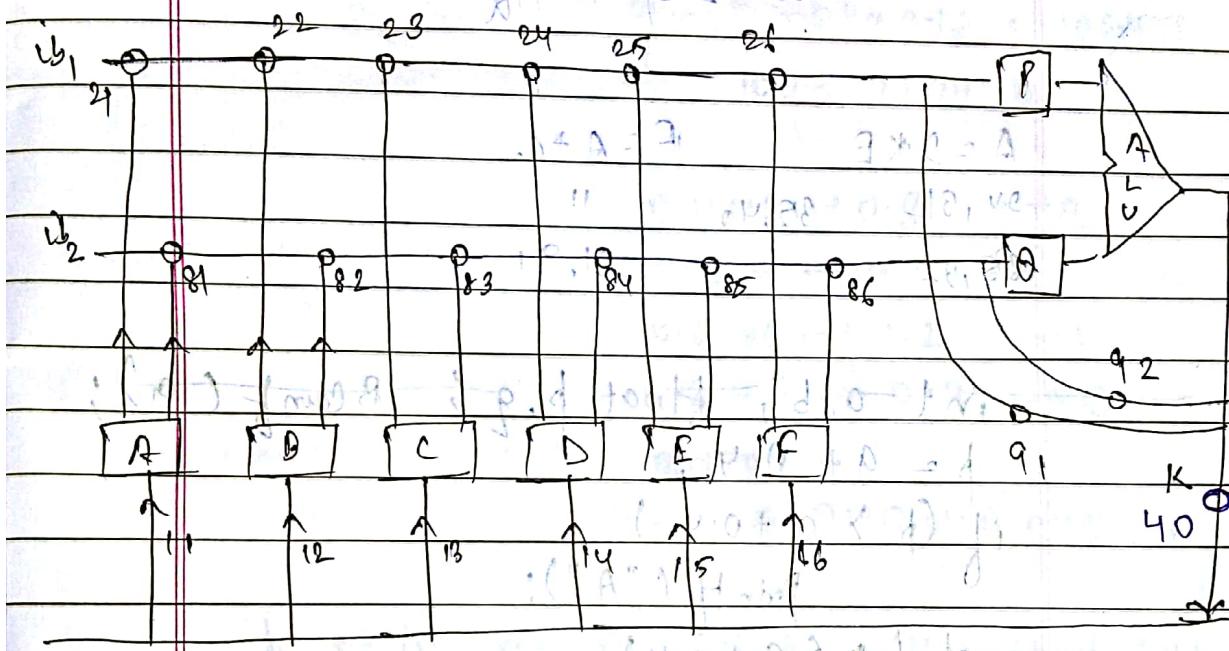
61

Page No. [ ]

Date 13/08/18

Saathi

IF <sub>1</sub>	F <sub>0</sub>	Compute,	SR
IF <sub>2</sub>	F <sub>0</sub>	C	SH



24, 31	35	11	front
85, 32			

Fetch operand A 5 time

Compute A+B 5 time

Store result A 7.5 time

$$A = D + E \quad F = B + C$$

5 machine  
cycle.

24, 31	35	11		
85, 32	22	31	33	16

# Pipeline

Date \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Saathi

$$A = D * E, \quad F = B + C$$

24, 31 P = D	35, 40 B = P * R	11 A ← ib' 31 33	740, 16 F ← R
85, 32 R = E	22 ib_1 = B { 32 83 ib_2 = C } R = P + Q		

$$A = D * E \quad F = A + C$$

24, 31      35, 40      11

85, 32      31, 91

```

int a, b; float p, q; & cout << f(a);
p = a + 0.4;
if (p > a + 0.4)
    printf("A");
if (p < a + 0.4)
    printf("B");
if (p == a + 0.4)
    printf("C");
    
```

8 bit float

input a      output

1      B (most significant)

2, 3      A (standard)

4, 5, 6, 7      A (least significant)

8 ... 15      B

output depends on microprocessor.

Saathi

Date 1/1/18

$$12 \rightarrow 1100_2 \text{ means first four bits}$$

$$0.4 \rightarrow 0.011001 \quad 0.4 \times 2^6 = 0.4 \times 64 = 256$$

$$0.4 \rightarrow 0.1100110$$

$$\text{all 9 bits total} \rightarrow 01100110 \text{ 25} \rightarrow 11001 \quad 8.2$$

$$0.4 \times 2^8 \leq 0.4 \times 256 = 1024$$

$$102 \rightarrow 1100110$$

$$102 \rightarrow 1100110$$

$$0.4 \times 2 \rightarrow 0.8 \rightarrow 0$$

$$0.8 \times 2 \rightarrow 1.6 \rightarrow 1.6 \rightarrow 1.6$$

$$0.6 \times 2 \rightarrow 1.2 \rightarrow 1$$

$$0.2 \times 2 \rightarrow 0.4 \rightarrow 0$$

$$\text{all 8 bits total} \rightarrow 0110 \quad 1100110$$

$$0.4 \times 0.4 \rightarrow 0.16 \rightarrow 0.0110 \quad 0110 \quad 0001 \quad 21 \rightarrow 3$$

p → in memory which will support 24 bit  
but in today's calls we will take 8.

11110000000000000000000000000000

11110000000000000000000000000000

p : 0.4 address at 0.4

1. 1.0110011 | 00110011 1.011011001100110

1.0110011 final in PC

number to decimal of 2303

and with 7.2693528

4 significant 7.269 → 7.269

5 7.26943 → 7.26943

6 7.26935 → 7.26935

7.26935 → 7.26935

110.10110 → 110.10110 → 8.2

=

4+2=6  $0.5 + \frac{1}{8} + \frac{1}{16} + \dots = 0.5 + 0.125 = 0.625$



Date 10/11/18, 18

```

main()
{
    int x, y, z;
    float u, v, w, t;
    scanf ("%d %d %d", &x, &y, &z);
    t = x + y;
    u = x * y;
    v = x + z;
    if (w > t) printf ("A");
    if (w < t) printf ("B");
    if (w == t) printf ("C");
}

```

Input  $x, y$   
 88, 82  
 16, 16.  
 $u = x \cdot y = 1010 \cdot 01010101$   
 $v = x + y = 1010 \cdot 01010101$   
 $t = u + v = 1010 \cdot 01010101$   
 $w = u + v = 1010 \cdot 01010101$

$$u = 10 \cdot 01010101$$

$$v = 1010 \cdot 01010101$$

$$w = 100010 \cdot 01010101$$

$$= 100010 \cdot 01010101$$

$$t = 100010 \cdot 01010101$$

$$\rightarrow 1000100000$$

# Positive float

Date \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

Saathi

4217.38 ) same mantissa,  
421738 )

$$\text{ie } 4.21738 \times 10^3$$

$$4.21738 \times 10^8$$

Let 6 significant digits.

(1) mantissa

(2) exponent

accap : 5 → 2 → 3+5 → 2

$$4.21738 \times 10^{-3} \rightarrow 2421738$$

$$4.21738 \times 10^8 \rightarrow 8421738$$

$$4.21738 \times 10^0 \rightarrow 5421738$$

datatype main()

{ int a; float b;

input

scanf("%d", &a);

7126384

printf("%f", b);

o/p

126.384

datatype main()

{ float a; 

--	--	--	--	--

b 

-	1	1	2	1	6	3	8	1	4
---	---	---	---	---	---	---	---	---	---

,

$$10^{10-9} = 1.26884 \times 10^{-7.5}$$

$$10^{-9} = 1.26884 \times 10^2$$

$$10^{10-9} = 1.26884 \times 10^2$$

datatype main()

Date 21/08/18

Saathi

1101.011

$2 + 18 \cdot 375$

Since MSB is 1  $\Rightarrow$  101.011

$2^3 = 8$   $18 \cdot 375 \times 2^2$

let our policy is 11000 mmmmmm

Accesse: 8000

$2 + 8 = 10$

92  
1010 10101  
~~1010 10110~~  
 $\rightarrow 18 \cdot 375$

1101 01101

38

19-8  
= 110101010  
 $10 \cdot 1101 \times 2^5$   
 $\rightarrow 90$

or 101 = 8 (don't see MSB) 81

eg 1011 10011  $\rightarrow 369$   
 $2^3 = 11.0011$  11001.1 25.5.

y. 0101 01010  
0101 01101

$2^3 = 10.1101 \Rightarrow 0.0101101$

$5-8$   
 $= -3$

$$S = \frac{1}{4} + \frac{1}{16} + \frac{1}{32} + \frac{1}{128}$$

Date \_\_\_\_\_

y

0101

-3 → 1101

$$1010 + 1 \equiv 1011 \rightarrow +3$$

y

$$0010 - 3 \text{ in Acc} 8 = -5$$

$$1100 + 1 \equiv 1101 \equiv 5$$



Let range

998 : 10000000

Access 50

$$12 \rightarrow 62$$

Add

$$-27 \rightarrow 23$$

85

$$-15 \leftarrow 35.01 * \text{Add or subtract}$$

50 from MSB

$$12 \rightarrow 62 * \text{ignore carry}$$

$$27 \rightarrow \underline{87} \text{ Complement MSB}$$

$$39 \leftarrow 89$$

$$-12 \rightarrow 38$$

$$-27 \rightarrow \underline{23}$$

$$61 \text{ (allow 1010)}$$

$$-39 \leftarrow 11$$

Access 8

4 bits

$$5 \rightarrow 1101$$

$$-3 \rightarrow \underline{0000} 0101$$

Date \_\_\_\_\_

$$-3 \quad \text{first} \quad +32 \quad 101103 \quad 25^3$$

$$870 \quad 0100+1 \rightarrow 0101 \quad \checkmark$$

100100

eg.

$$\begin{array}{r} 5 \\ -3 \\ \hline 0101 \end{array} \quad 1101 + 0101 \rightarrow 0010$$

$$+2 \leftarrow 1010 \quad \Rightarrow \text{complement MSB}$$

eg

$$2 \quad 1010$$

$$3 \quad 1011$$

$$0101$$

$$5 \leftarrow 1101$$

 $\Rightarrow \text{complement MSB}$ 

et

eg

$$-2 \quad 0110$$

$$-3 \quad 0101$$

$$1001$$

$$-5 \leftarrow 0001 \rightarrow 1100+1$$

$$1101$$

Access : 128 + 204 = 332

eg.

$$12 \rightarrow 140$$

$$-27 \rightarrow 101$$

$$241$$

$$-15 \leftarrow 113$$

eg

$$12 \rightarrow 140$$

$$27 \rightarrow 155$$

$$295$$

$$39 \leftarrow 167$$

Date \_\_\_ / \_\_\_ / \_\_\_

$$\begin{array}{r}
 80 \\
 + 80 \\
 \hline
 160
 \end{array}
 \quad
 \begin{array}{r}
 208 \\
 + 208 \\
 \hline
 416
 \end{array}
 \quad
 \begin{array}{r}
 8 \\
 + 8 \\
 \hline
 16
 \end{array}$$

$$\begin{array}{r}
 32 \\
 + 160 \\
 \hline
 192
 \end{array}
 \quad
 \begin{array}{r}
 101 \\
 + 101 \\
 \hline
 202
 \end{array}
 \quad
 \begin{array}{r}
 2 \\
 + 2 \\
 \hline
 4
 \end{array}$$

8217 from old paper (C)

$$0100 \rightarrow 2+$$

$$\begin{array}{r}
 0101 \\
 + 1001 \\
 \hline
 1100
 \end{array}
 \quad
 \begin{array}{r}
 2 \\
 + 2 \\
 \hline
 4
 \end{array}$$

8219 from old paper (S)

$$1010 \rightarrow 3$$

$$\begin{array}{c}
 a \xrightarrow{\quad} p \\
 \downarrow \quad \quad \quad \downarrow \\
 0100 \xrightarrow{\quad} 2 \\
 1010 \xrightarrow{\quad} 3
 \end{array}$$

$$\begin{array}{c}
 10001 \xrightarrow{\quad} 2 \\
 1000 \xrightarrow{\quad} 2 \\
 1011 \xrightarrow{\quad} 3
 \end{array}$$

$$p = NOR(a, q)$$

$$q = NOR(b, p)$$

$$\begin{array}{r}
 011 \xrightarrow{\quad} 2 \\
 101 \xrightarrow{\quad} 2
 \end{array}
 \quad
 \begin{array}{r}
 2 \\
 0
 \end{array}$$

$$\begin{array}{r}
 1010 \\
 111
 \end{array}
 \quad
 \begin{array}{r}
 2 \\
 1
 \end{array}$$

$$111 \rightarrow 21-$$

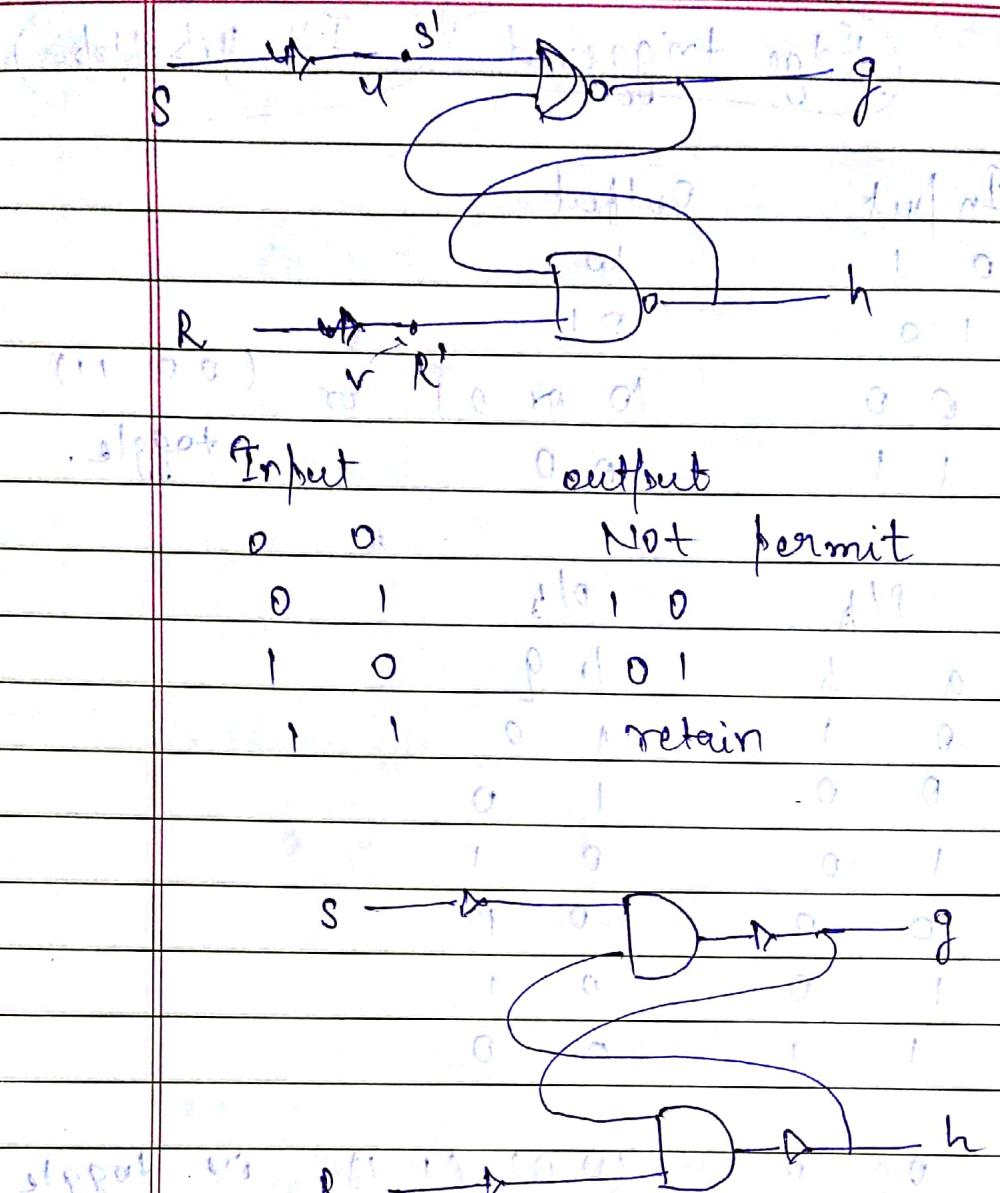
$$\begin{array}{r}
 011 \xrightarrow{\quad} 2 \\
 211 \xrightarrow{\quad} 2
 \end{array}
 \quad
 \begin{array}{r}
 2 \\
 1
 \end{array}$$



# S R flip flop

Date \_\_\_\_\_ / \_\_\_\_\_ / \_\_\_\_\_

*Saathi*



Standard SR  
flip flop

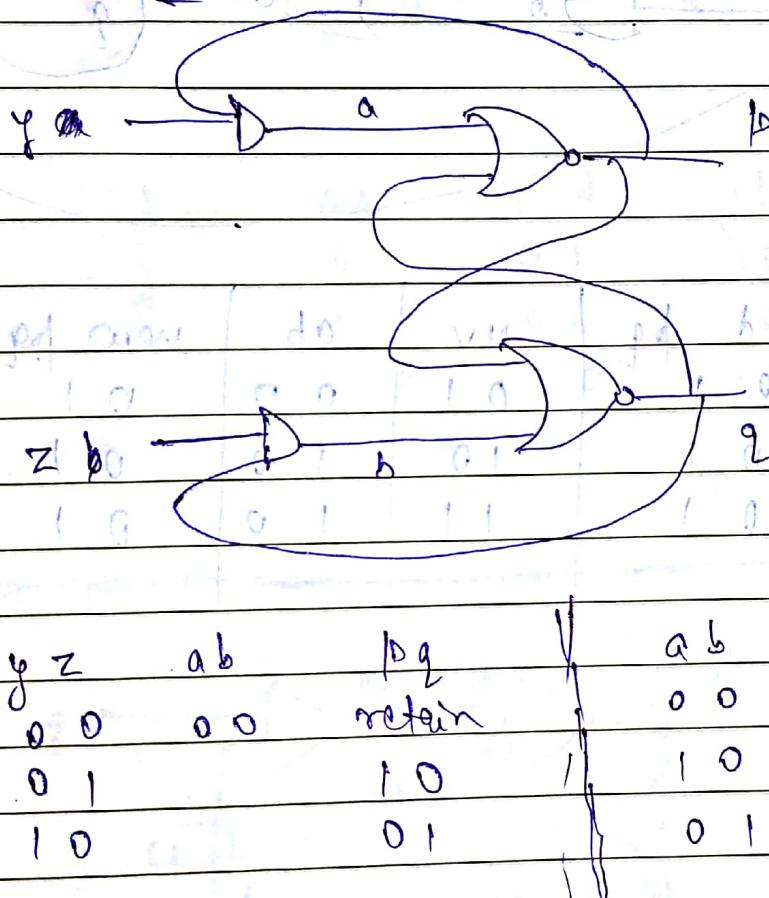
$$g = \text{AND}'(S', h)$$

$$h = \text{AND}'(R', g)$$

Input	0 1	Output	1	0
S R	1 0	g - h	0	1
	1 0	1 0	1	0
	0 0	1 0	1	0
	0 1	0 1	1	0
	0 0	0 1	1	0

Date 27, 08, 18

\* S R flip flop      10 → 10'      01 → 01  
                           00 → return  
                           11 → not permitted



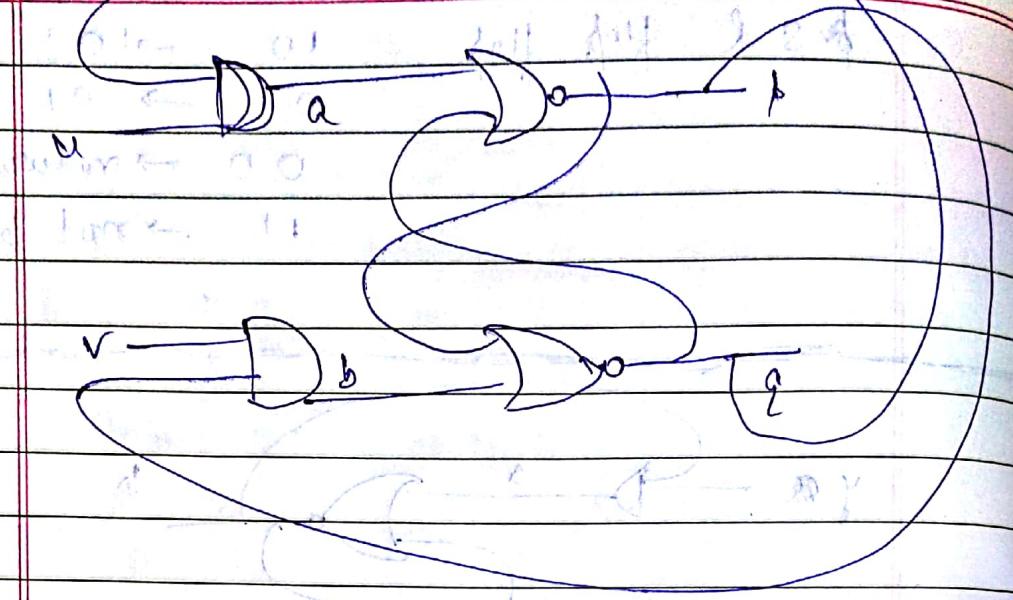
$y z$	$ab$	$10q$	$q$	$ab$	$10q$
0 0	0 0	retain		0 0	retain
0 1		1 0	1	1 0	0 1
1 0		0 1	1	0 1	1 0

old $10q$	$y z$	$ab$	new $10q$
0 1	0 1	0 1	1 0
1 0	0 1	0 0	retain 1 0
	1 1		

Date / /

8/29/12

Saathi



old pq	uv	ab	new pq
0 1	0 1	0 0	0 1
0 1	1 0	1 0	0 1
0 1	1 1	1 0	0 1

0 1 0 0 0 0 0 0  
0 1 0 1 0 1 1 0  
0 1 1 0 1 0 0 1

0 1 0 0 1 0 0 0 0 0 0 0

0 1 0 1 0 1 0 1 0 1 0

0 1 0 0 0 1 0 1 0 0 1

1 1 0 0

0 0 1 1

1 1 0 0

0 0 1 1

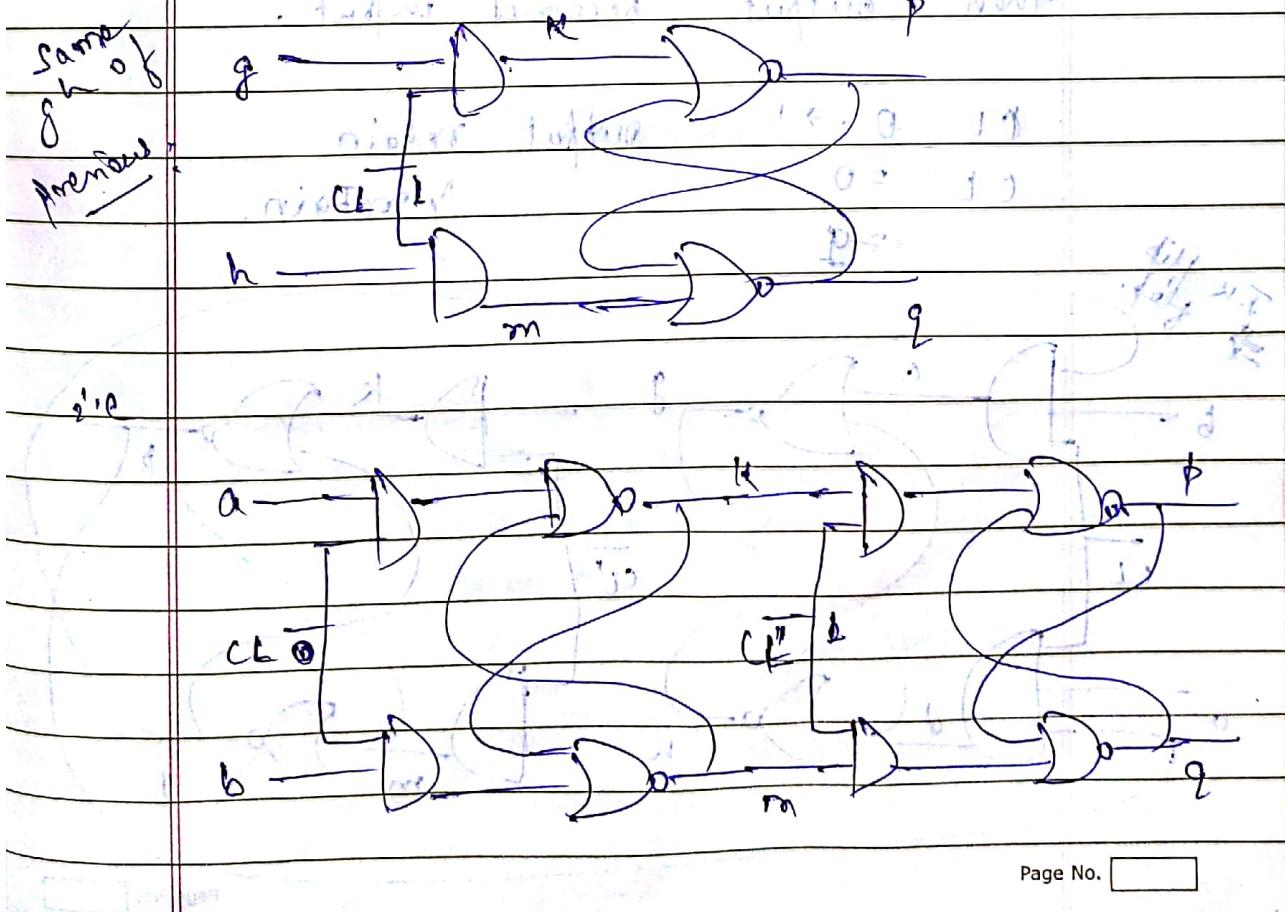
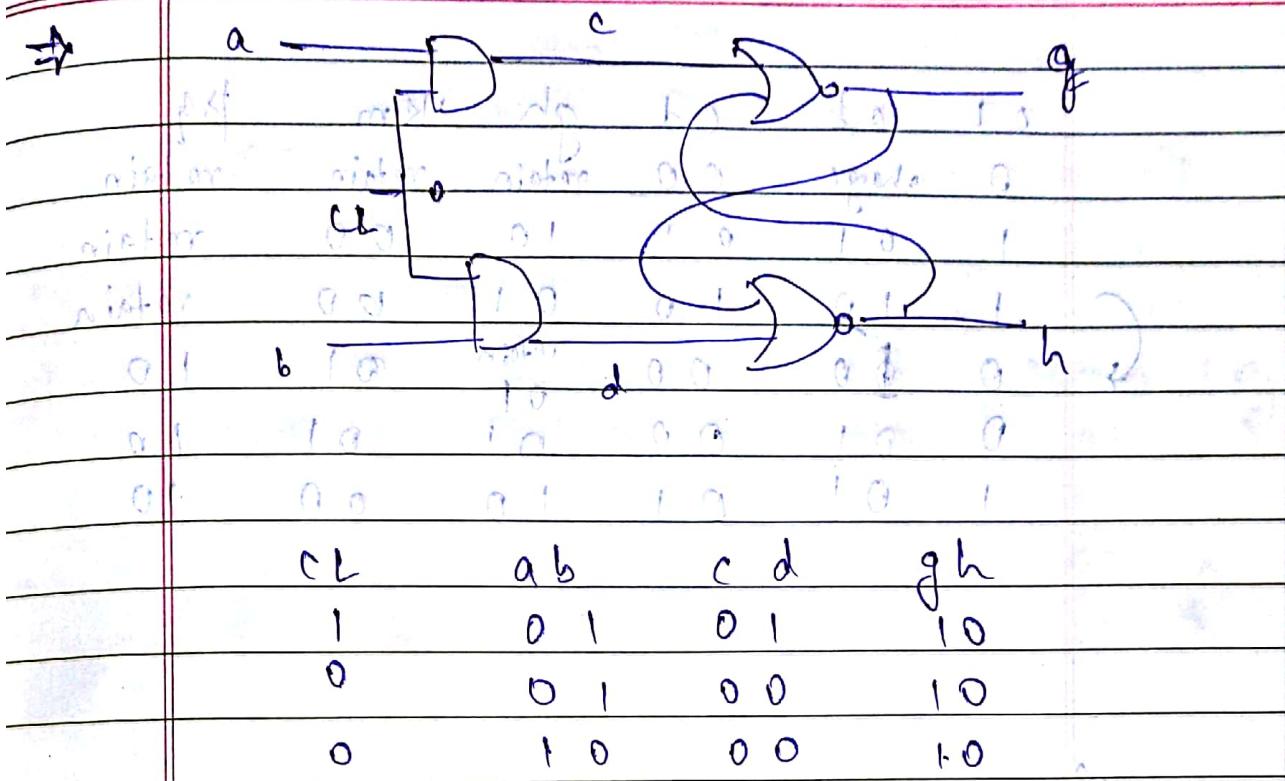
1 1 0 0

0 0 1 1

Page No.

if  $CL = 0 \rightarrow$  retained. 12  
 $CL = 1 \rightarrow$  then only output ~~is satisfied.~~

Date \_\_\_\_\_



CL and CL' & C, O = 1

Date \_\_\_\_\_

Saathi

CL ab cd gh 'Km jg

0 charge 0 0 retain retain retain

1 0 1 0 1 1 0 0 0 retain

1 1 0 1 0 0 1 0 0 retain

0 0 0 0 0 1 0 1 1 0 retain

0 0 1 0 0 0 1 0 1 1 0

1 0 1 0 1 1 0 0 0 1 0

dp b j do j

0 1 : 0 1 0 i

0 0 1 0 0 1 0 0 0 1 0

0 1 0 0 0 1 1 0

fill next

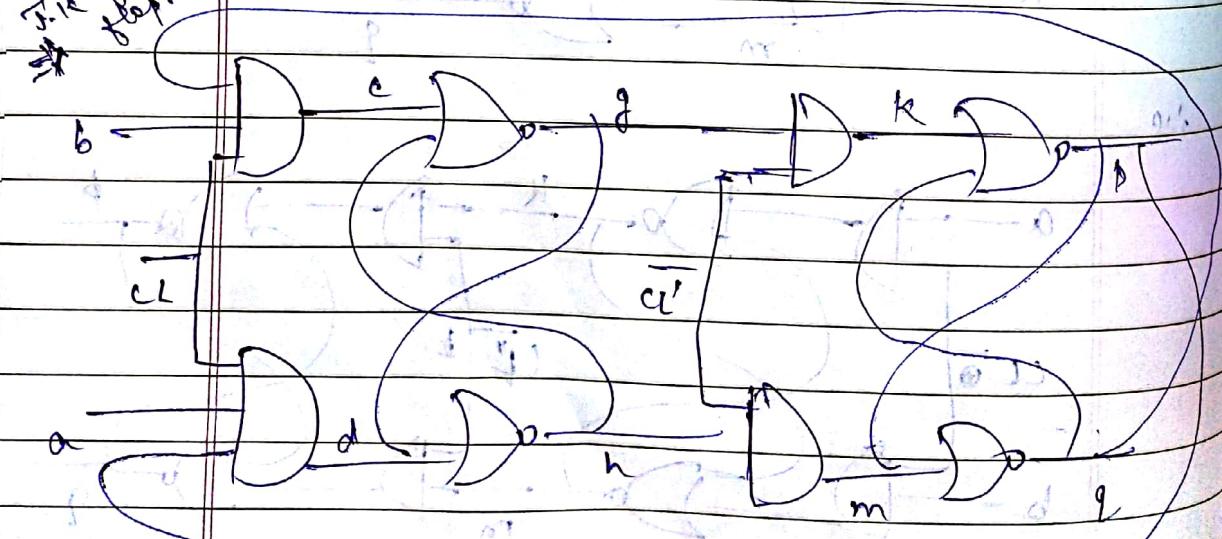
~~to edges (big good)~~

- \* When CL changes from 1 to 0  
then output becomes input.

CL = 0 → 1      output retain

CL = 1      j retain.

J.12 flip flop.



final.

Date 27, 08, 18

Saathi

CL ab cd gh km pq

1 01 00 retain retain

0 01 00 retain retain

old pq

10 1 01 01 10 00 retain 10

10 0 01 01 00 10 10 01

01 1 01 00 10 10 01

01 1 11 00 01 00 01

01 0 0011 00 01 01 10

when CL  $\rightarrow$  0 JK flip flop

input output

01 01

10 10

00 retain

11 complement.

when ab = 11

CL  $\rightarrow$  1

pq = 0

cd = qp

gh = pq

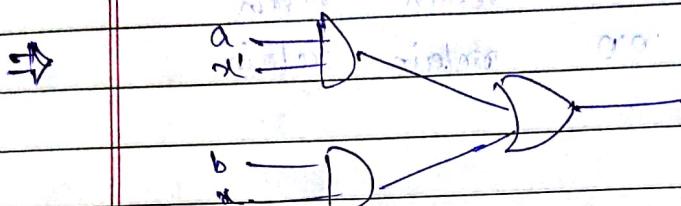
km = 00

pq retain.

Saathi

Date    /    /

## Multiplexer



90 0 10 10

on fib if  $a = b$  then  $b$  else  $a$ .

01 01 09 10 11 12 10

99 19 96 11 1 10

10 10 00 Mar 19

10a → 13 00 1000 3 100

$x_1^{\prime \prime} \leftarrow$

~~100% 100% 100%~~

$c \rightarrow 0$  as  $t \rightarrow \infty$

$y'$   $\frac{dy}{dx}$

*nictar* 0 0

def  $\alpha$   $\rightarrow$   $\text{function}(\text{lambda})$   $\rightarrow M_2$

2-14

At 11:30 a.m. on April 12, 1945, the Japanese submarine I-58 was sunk by the American submarine USS *Wahoo*.

2 4 1 K 62

8 8 17 A

6. 10 1 dfabbg

part 1 09 2018

4. *Tripteronotus*

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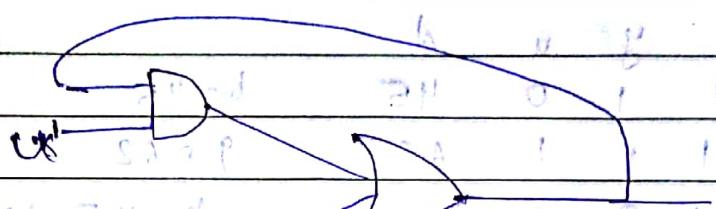
Date 28/08/18

When

$$u=0 \cdot p=k$$

$$u=1 \cdot q=k$$

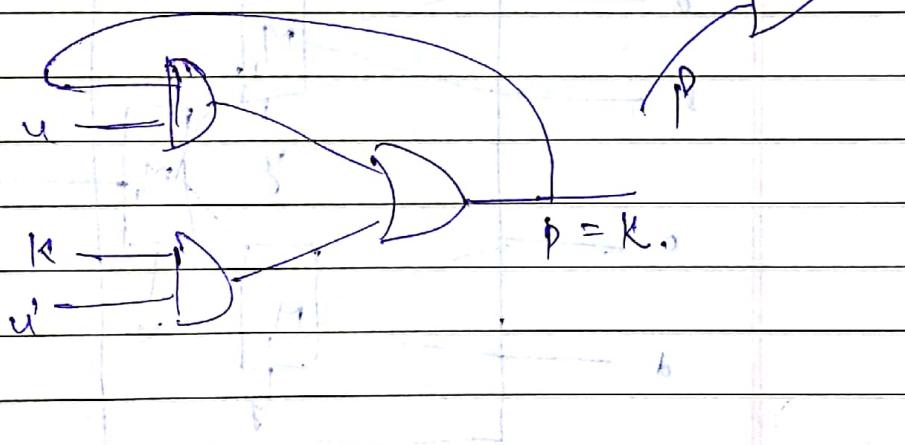
saathi



$$\text{Op } Z = \text{or}(\text{and}(z, x'), \text{and}(K, x))$$

Input K x

$$\begin{array}{ll} x=0 & \text{Op obtain} \\ x=1 & \text{Op = CIP} \end{array}$$



x y K u v a b c d

0 0 0

$$p=a$$

0 0 1

$$q=a$$

0 1 0

$$p=b$$

0 1 1

$$q=b$$

1 0 0

$$p=c$$

1 0 1

$$q=c$$

1 1 0

$$d \Rightarrow p=d$$

1 1 1

$$d \Rightarrow q=d$$

W hen

C.C P+q Date 21/9/19

81 80 82

Saathi

a y u d

1 1 0 45 p=45

1 1 1 62 q=62

Now

b=p+q

1 0 0 -

p=45+62=107

1 1 1 6

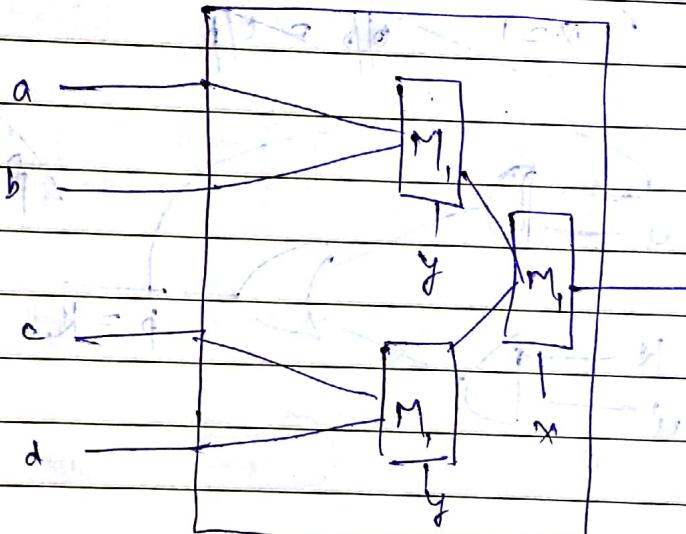
q=6

0 1 0 -

-p+q = 107-6

(10, 8) bao. (10, 8) and sum = 10 + 8 = 18 = 642

Method for 4x4



b and ay 11 0 0 0

0 0 p 0 0 0 0 0

0 0 q 0 0 0 0 1

M2 0 0 0 1 1 0

x y K 0 0 0 0 1

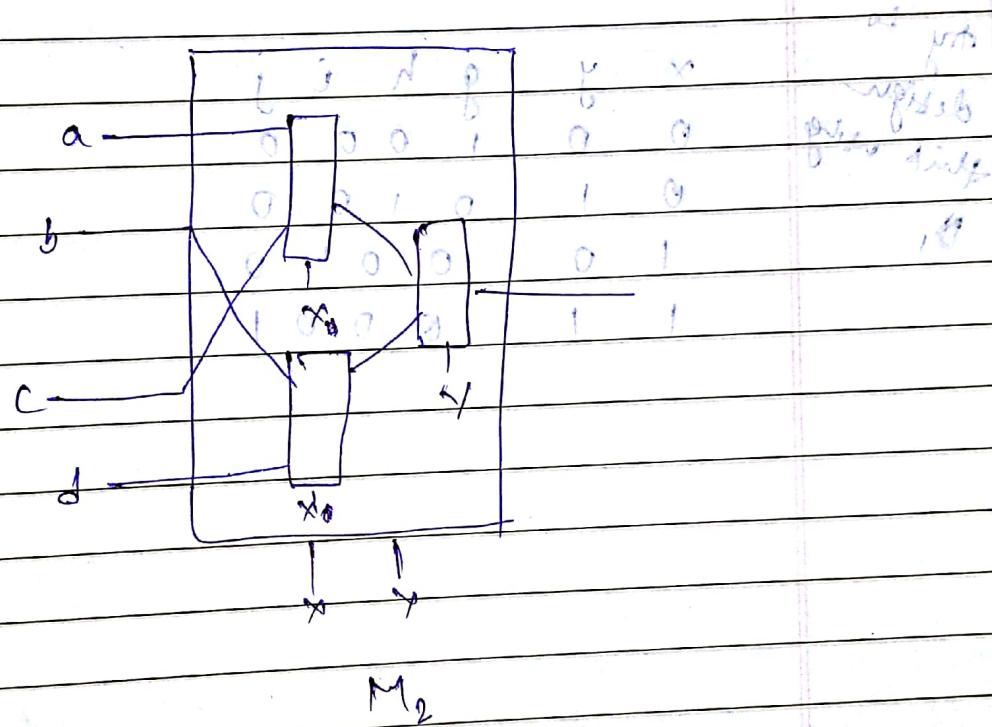
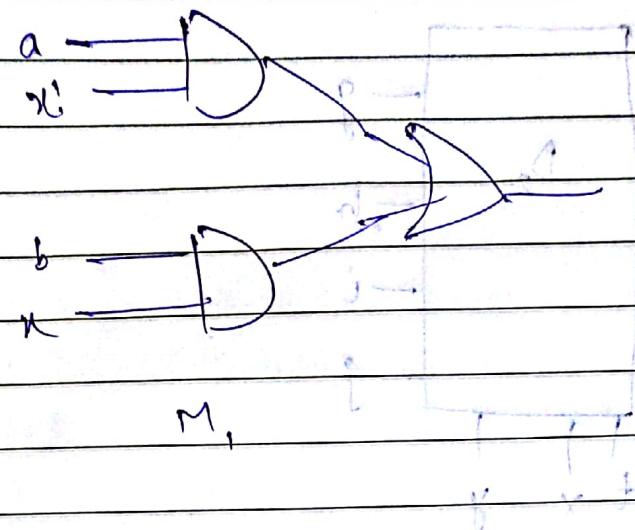
0 0 0 1 0 1

0 0 1 0 1 1

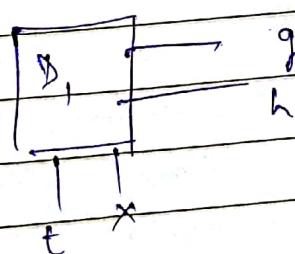
1 0 0 1 1 1

1 1 d

Date 28/08/18



→ Decoder



$x=0 \quad g=1 \quad h=0$   
 $x=1 \quad g=0 \quad h=1$   
 when  $t=1$ .

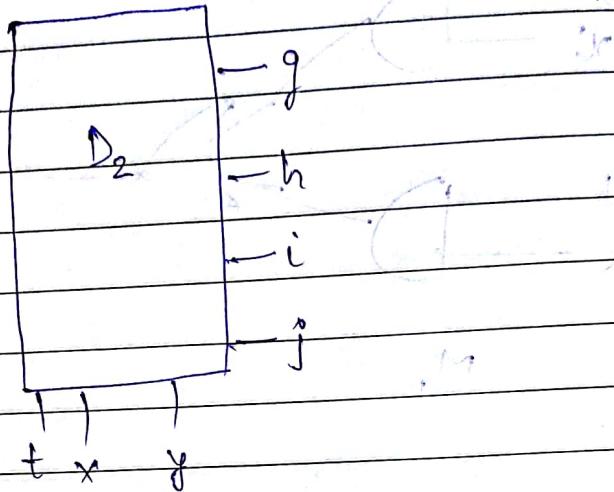
when  $t=0$

both  $g, h$  are 0

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Saathi

Date 1/1/



try to  
design  
flip using

	$x$	$y$	$g$	$h$	$i$	$j$	
$D_1$	0	0	1	0	0	0	
	0	1	0	1	0	0	
	1	0	0	0	1	0	
	1	1	0	0	0	1	

and 13P 0+2y

1st value 13P

1st value 13P

1st value 13P

1st value 13P