আন্তর্জাতিক ইসলামী বিশ্ববিদ্যালয় চট্টগ্রাম
الجامعة الإسلامية العالمية شيتاغونغ
International Islamic University Chittagong

LAB REPORT/ Assignment

Student Identity:

Name:	Intahadul Hoque
ID:	C221059
Semester:	Spring'23
Section:	3BM
Department:	CSE

Experiment Information:

Experiment No:	01
Experiment Name:	Counter, RAM, ROM, Memory Unit, Magnitude comparator, Carry look Ahead related p. solve
Course Code:	CSE-2323
Course Title	Digital logic Design
Date of Experiment:	5/19/2023
Date of Submission:	31/05/2023.

Submitted to:

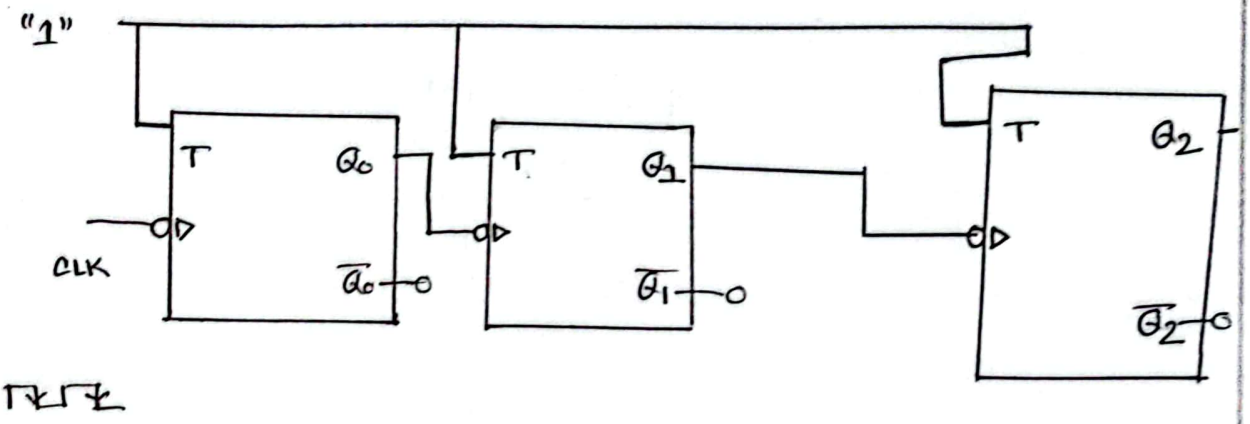
	Remarks:

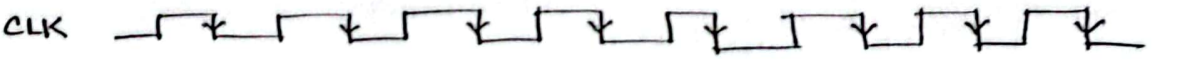
CamScanner

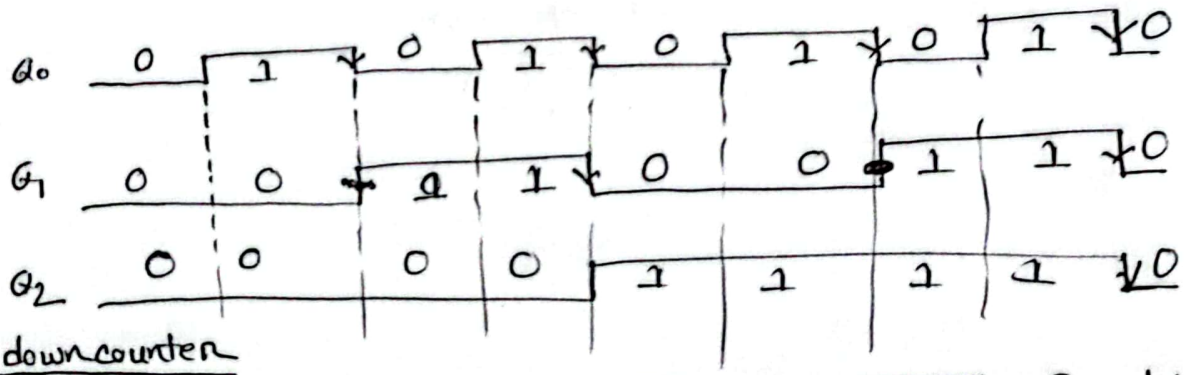
TOPIC - counter

1a Design an asynchronous ripple-down counter. (Aut-22) (Sp-22)

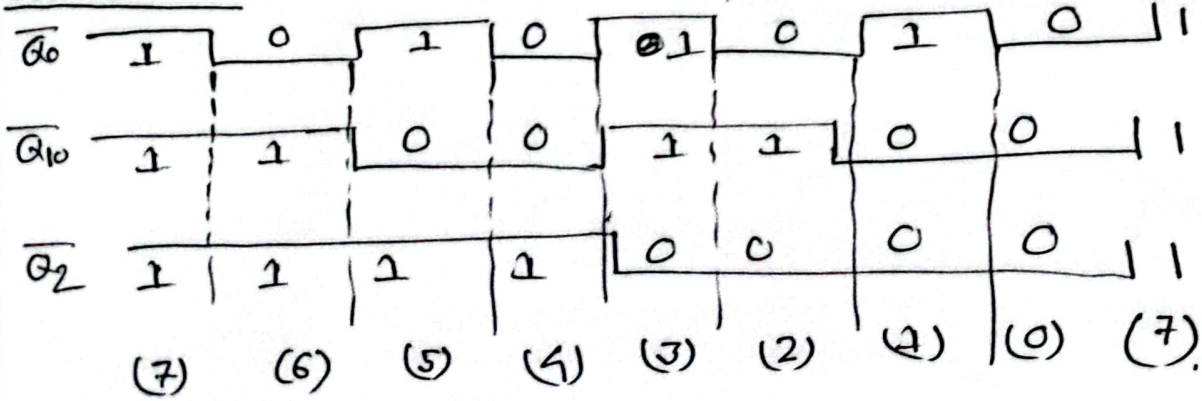
Soln:-







downcounter

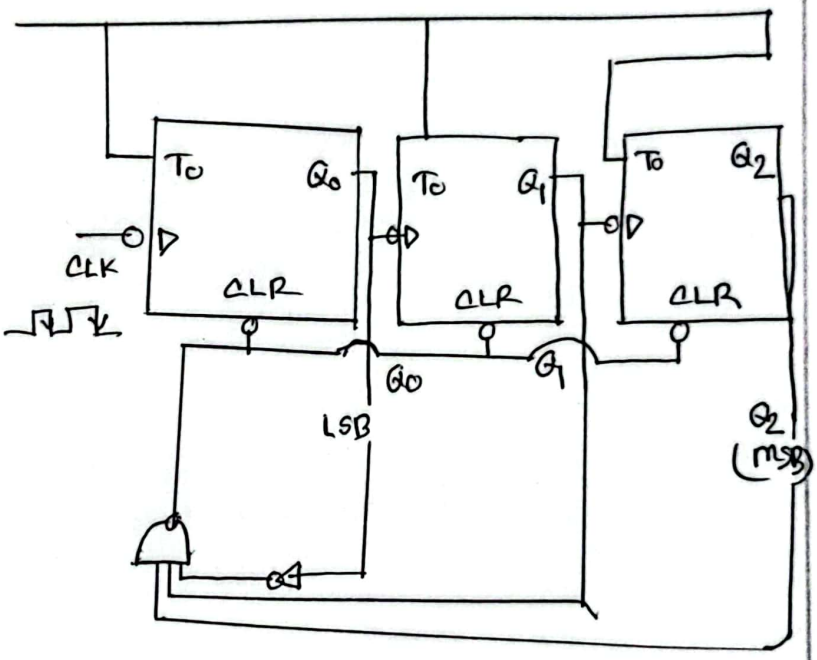


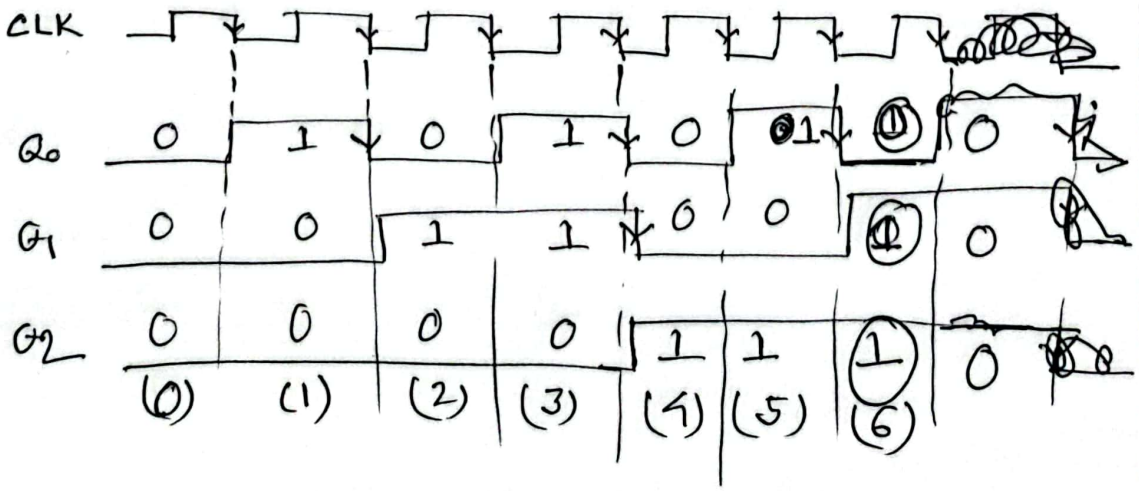
2. (a) Design a modulo counter by asynchronous counter (Act-22) (Sp-22)

Ex: Modulo 6 counter.

It starts from 0 and it will count up to 5.

Q_2	Q_1	Q_0
0	0	0
0	0	1
0	1	0
0	1	1
1	0	0
1	0	1
1	1	0





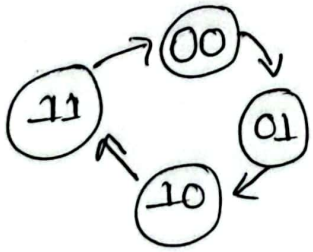
3(a) Design a 2 bits synchronous counter by JK Flip-Flop. [Au- 22]

There are 2bits. So, Flip-flop = JK Flip Flop.

Excitation table of JK Flip-Flop :-

Qn	Qn+1	J	K
0	0	0	X
0	1	1	X
1	0	X	1
1	1	X	0

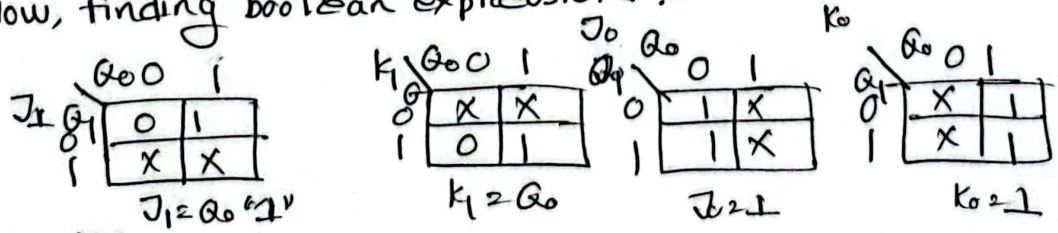
State diagram :-



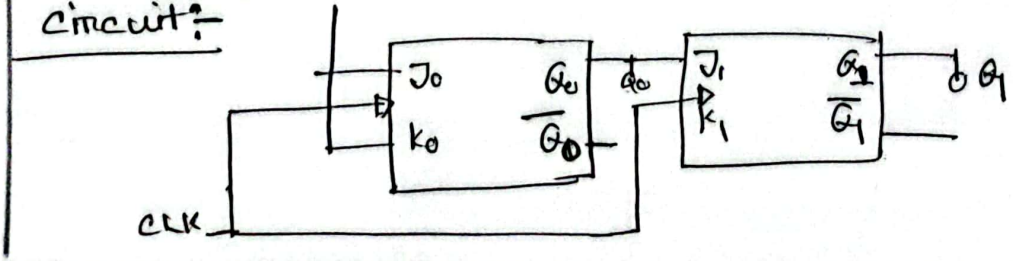
State table :-

Q_1	Q_0	Q_1^+	Q_0^+	J_1	K_1	J_0	K_0
0	0	0	1	0	X	1	X
0	1	1	0	1	X	X	1
1	0	1	1	X	0	1	X
1	1	0	0	X	1	X	1

Now, finding boolean expression :-



Circuit :-



Intahadul Haque C221039

CamScanner

7(a) Design counter using SR flip flop with repeated binary sequence : 0, 1, 3, 2, 6, 4, 5, 7. (Au-22) (Sp-22)

Total bits = total flip flop = 3

flip flop required = T flip flop.

Excitation Table of T flip flop:

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

state table (0, 1, 3, 2, 6, 4, 5, 7)

Q_A Q_B Q_C	Q_A^+ Q_B^+ Q_C^+	T_A T_B T_C
0 0 0	0 0 1	0 0 1
0 0 1	0 1 1	0 1 0
0 1 0	1 1 0	1 0 0
0 1 1	0 1 0	0 0 1
1 0 0	1 0 1	0 0 1
1 0 1	0 1 1	0 1 0
1 1 0	1 0 0	0 1 0
1 1 1	X X X	X X X

CamScanner

T_A

Q_C \ $Q_A Q_B$	00	01	11	10
0	0	0	0	1
1	0	0	X	0

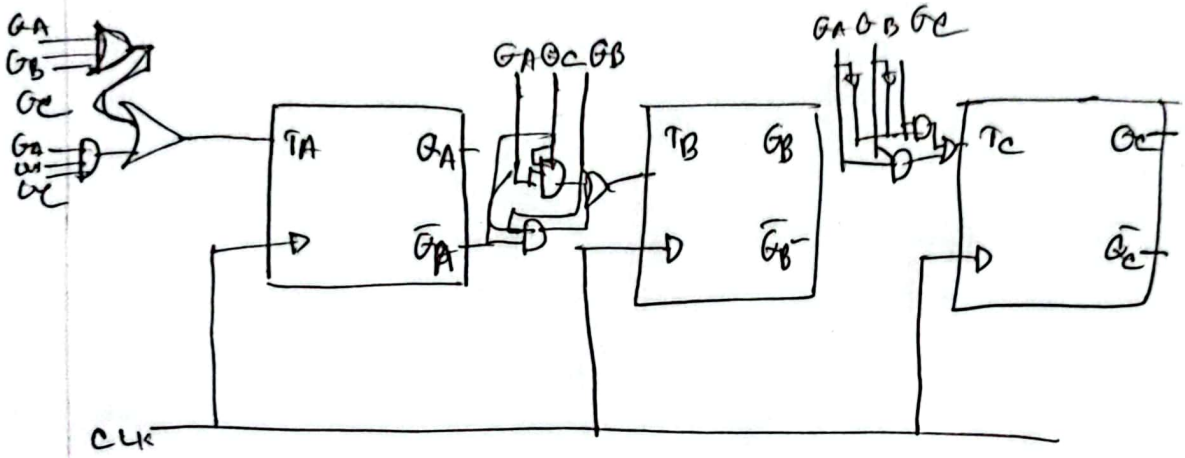
T_B

Q_C \ $Q_A Q_B$	00	01	11	10
0	0	1	0	0
1	0	0	X	1

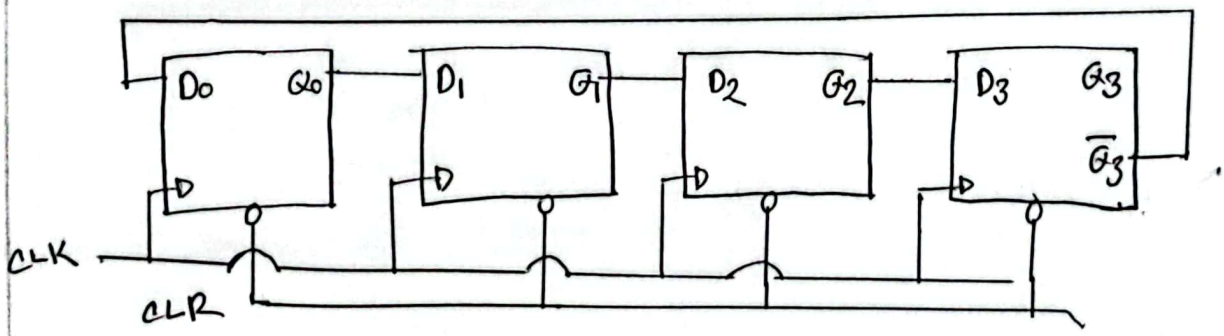
T_C

Q_C \ $Q_A Q_B$	00	01	11	10
0	1	0	1	0
1	1	0	X	0

$T_A = Q_A Q_B Q_C + Q_A \bar{Q}_B \bar{Q}_C$ $T_B = Q_A Q_C + \bar{Q}_A Q_B \bar{C}$ $T_C = \bar{Q}_A \bar{Q}_B Q_C + Q_A Q_B$



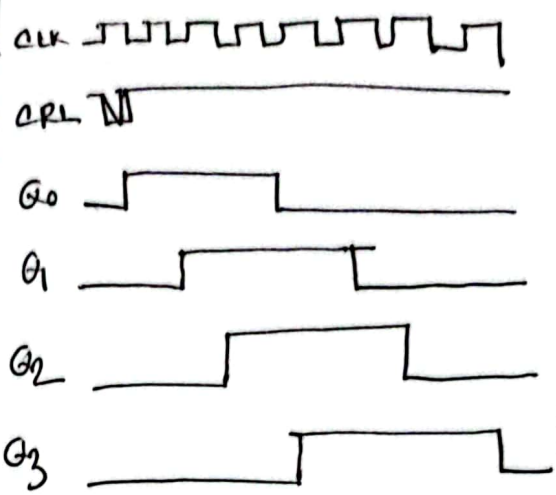
4(b) Design Jonhson's counter.



Intanadul Hoque C221059

CLR	CLK	Q_0	Q_1	Q_2	Q_3
⌐	X	0	0	0	0
1	↓	1	0	0	0
1	↓	1	1	0	0
1	↓	1	1	1	0
1	↓	1	1	1	1
1	↓	0	1	1	1
1	↓	0	0	1	1
1	↓	0	0	0	1
1	↓	0	0	0	0

wave form



1(B) Design a J-K flip flop and show its characteristics equation, characteristic table and logic diagram (Sp-22).

5(b) Design 3bit down counter with T-flip flop. (Autum-19)

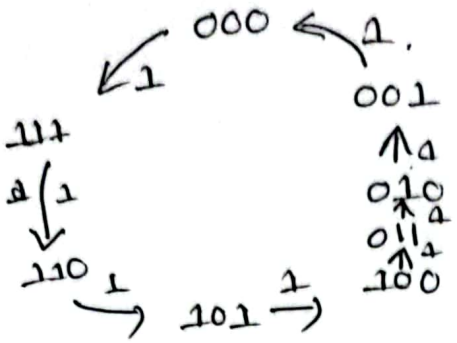
Given that, n = 3bits flip flop = T flip flop.

Exhitation table of T Flip Flop :-

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

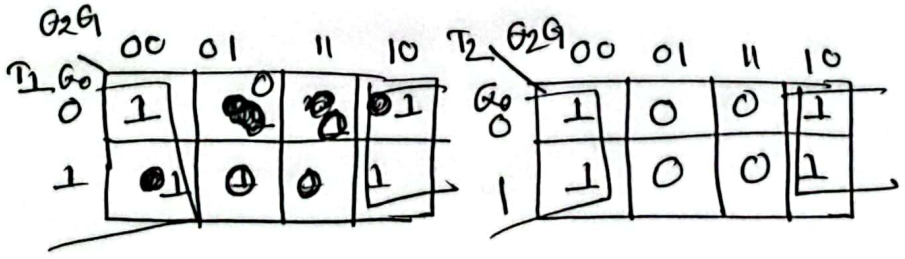
CamScanner

m=1, Down counter.



state table :-

m	Q_2	Q_1	Q_0	Q_2^+	Q_1^+	Q_0^+	T_2	T_1	T_0
1	0	0	0	1	1	1	1	1	1
1	0	0	1	0	0	0	0	0	1
1	0	1	0	0	0	1	0	1	1
1	0	1	1	0	1	0	1	0	1
1	1	0	0	0	1	1	1	1	1
1	1	0	1	1	0	0	0	0	1
1	1	1	0	1	0	1	0	1	1
1	1	1	1	1	1	0	0	0	1



$T_0 = 1$.

$T_1 = \overline{Q_1}$

$T_2 = \overline{Q_1}$.

Intahadul Hoque C221059.

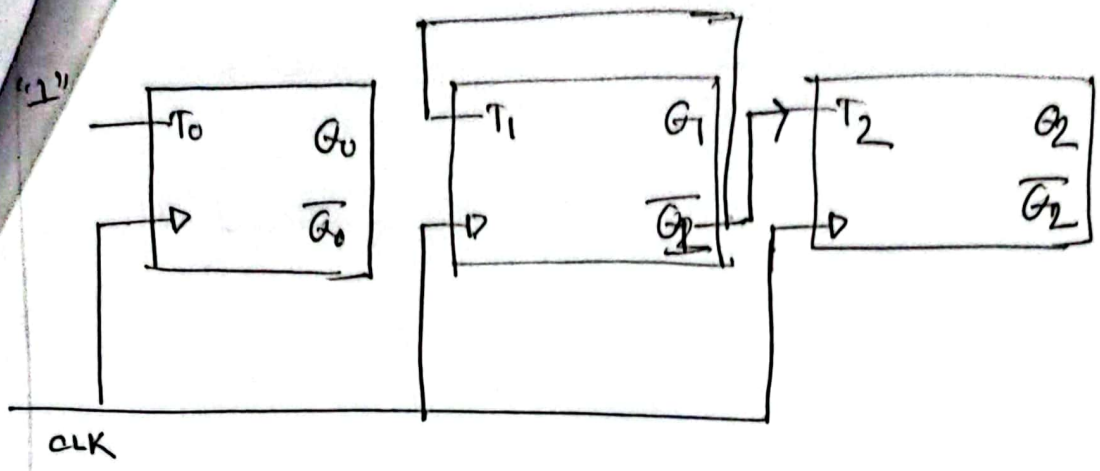


Fig.1 :- circuit diagram.

TOPIC : RAM & ROM

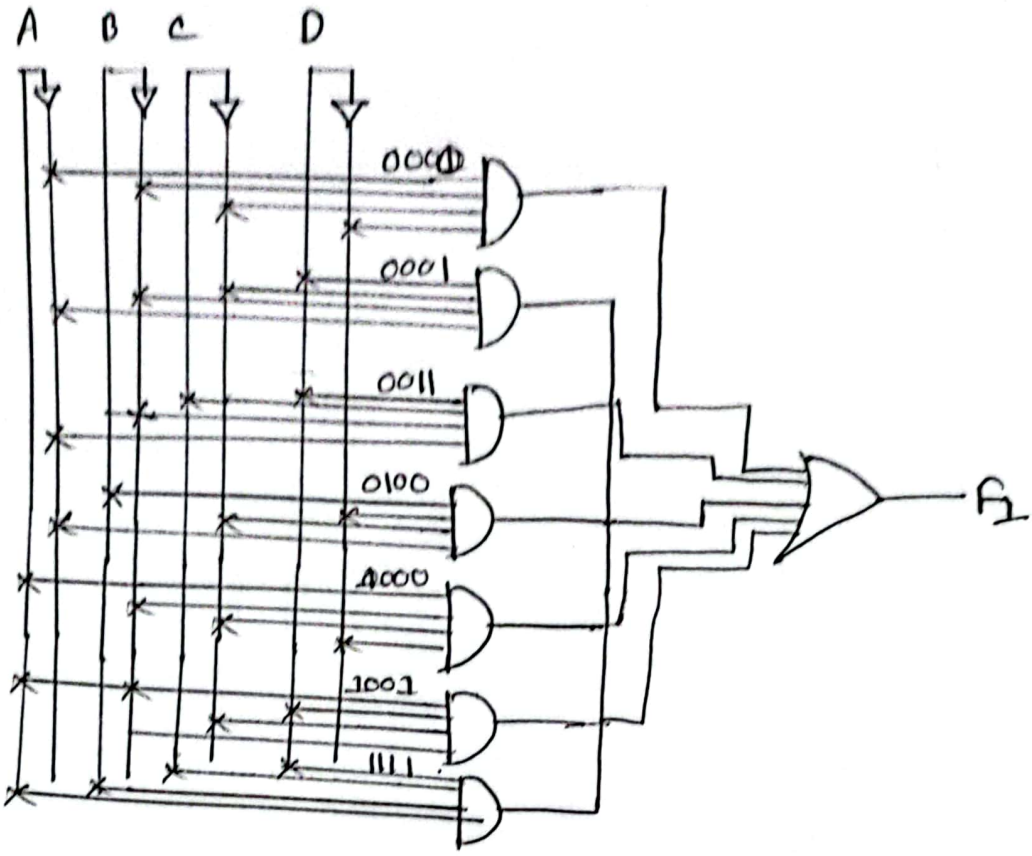
(5a) Define Rom [Sp-22]

A Rom is essentially a memory device in which a fixed set of binary information is stored.

5(b) Implement the function with Rom. $F(w,x,y,z) = \Sigma(0,1,3,4,8,9,15)$.

max bits needed = 4 bits

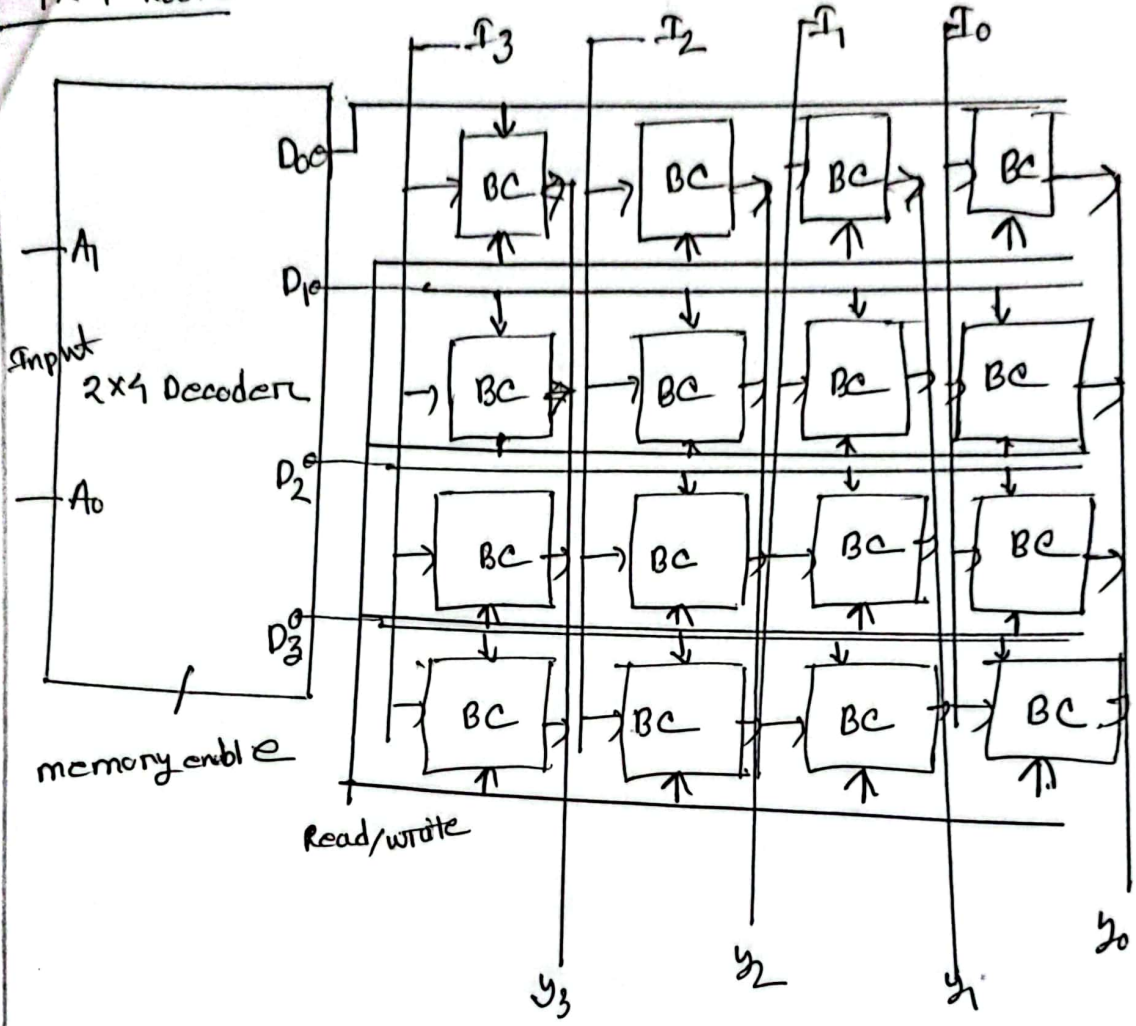
Now, desiging the function with ROM



3C what is memory cell? Design 4x4 Ram and describe its operation. (Autum-19).

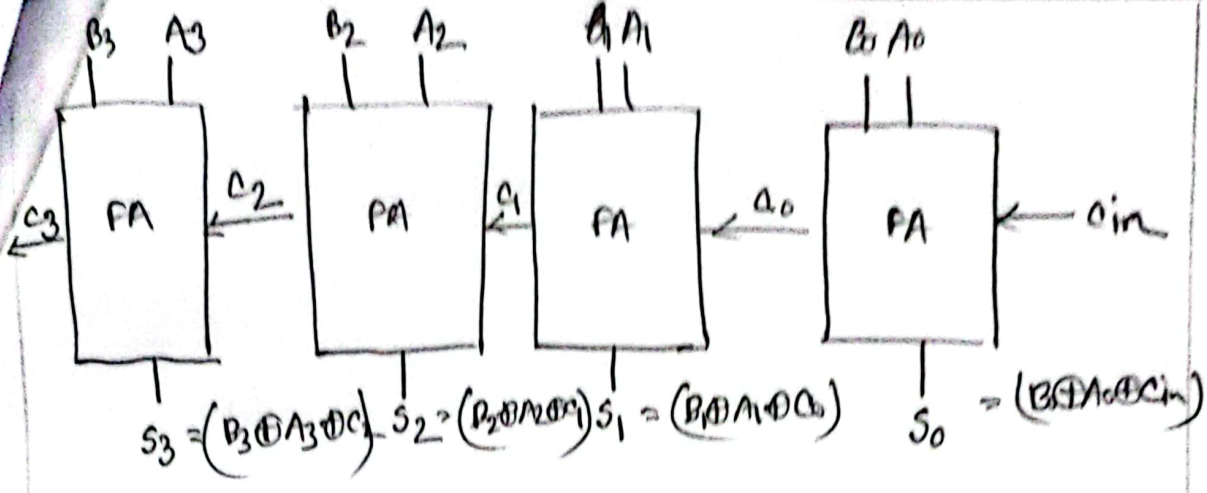
Memory Cell:- The memory is the fundamental building block of computer memory. The memory cell is an electronic circuit that stores one bit of binary information and it must be set to be store logic 1 and reset to store a logic 0.

4X4 Ram



Topic : Look Ahead carry generator, Comparator & Sequential circuit

1(a) Design a look ahead carry generator for 3 bit full adder.



B_1	A_1	C_0	C_1
0	0	0	0
0	0	1	0
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	1
1	1	1	1

$$C_1 = B_1A_1C_0 + B_1A_1\bar{C_0} + B_1\bar{A_1}C_0 + \bar{B_1}A_1C_0$$

$$C_1 = B_1A_1(C_0+\bar{C_0}) + C_0(B_1\bar{A_1} + \bar{B_1}A_1)$$

$$C_1 = B_1A_1 + (B_1 \oplus A_1)C_0.$$

$$C_i = B_iA_i + (B_i \oplus A_i)C_{i-1}$$

$$= G_i + P_iC_{i-1}$$

Carry generator — Carry propagator

for $i=0$

$C_0 = G_0 + P_0C_{in}$

for $i=1$

$C_1 = G_1 + P_1C_0$

$= G_1 + P_1[G_0 + P_0C_{in}]$

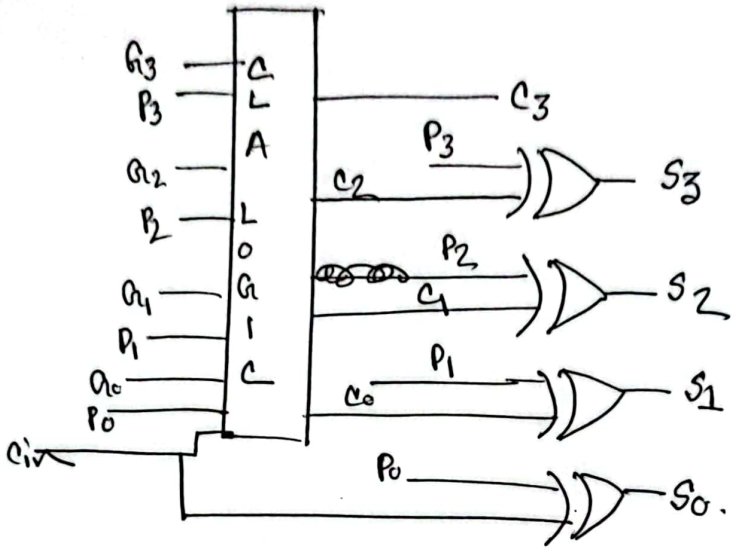
$C_2 = G_2 + P_2C_1$

$= G_2 + P_2[G_1 + P_1[G_0 + P_0C_{in}]$

$= G_2 + P_2G_1 + P_2P_1G_0 + P_1P_2P_0C_{in}$

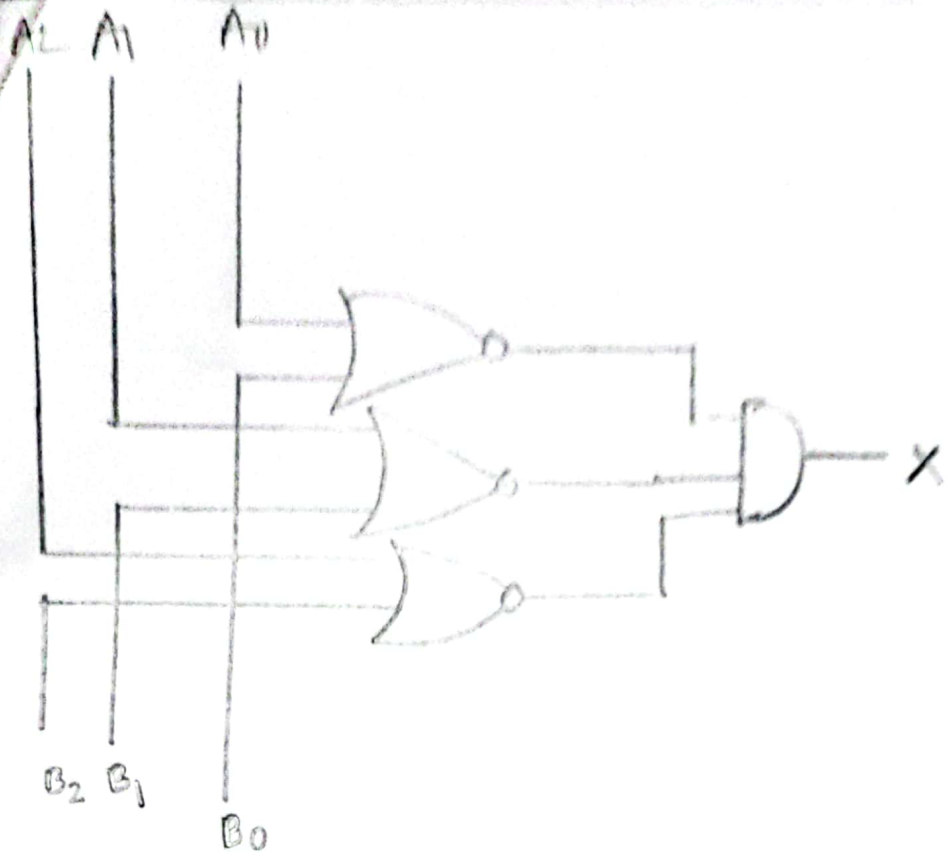
$C_3 = G_3 + P_3 C_2$

$= G_3 + P_3 (G_2 + P_2 C_1)$.



2(b) Design a circuit that compares two 3 bits numbers A and B, if they are equal the circuit has one output x so that x=1 if A=B, and x=0. if A≠B . Show the output providing data into the circuit [Aut - 22]

Circuit that compare 3 bits numbers :-



$X = (A_0 \odot B_0) \cdot (A_2 \odot B_2) \cdot (A_1 \odot B_1)$

A_2	A_1	A_0	B_2	B_1	B_0	X
0	0	0	0	0	0	1
0	0	0	0	0	1	0
0	0	0	0	1	0	0
0	0	0	0	1	1	0
0	0	0	1	0	0	0
0	0	0	1	0	1	0
⋮			⋮	⋮	⋮	⋮
1	1	1	1	1	1	1