

Assignment 14

Class - SE IV

Roll NO - 21430

Batch - F4

D.O.S - 14/01/2021

Title - Design of ASM chart using MUX controller method.

Objective - i Design and implement waveform generator ckt using ASM based multiplexer controller method

Apparatus - i Digital board, GP-4 patch cords, IC-74LS74, IC-74LS32, IC-74LS08 and required logic gates if any.

Theory - i

Algorithm state machine (ASM) charts - i

1. Used to design complex sequential cks.
2. Concepts is similar to software flow-chart.
3. Also known as "Hardware flow chart".
4. ASM chart is one step forward towards the implementing hardware ckt i.e. using ASM chart we can directly design the hardware ckt.

Basic concept of ASM charts - i

1. State box.
2. Design box.
3. Conditional output box.

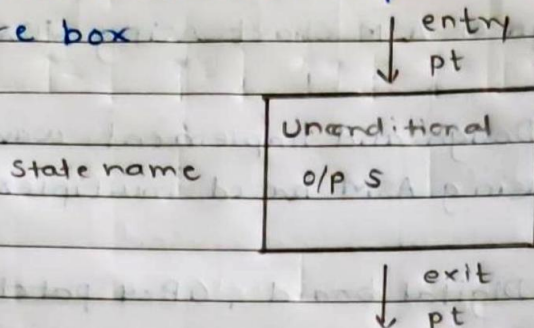
1. state box -

i. rectangular shape.

2. Each state box represents one state of seq. ckt

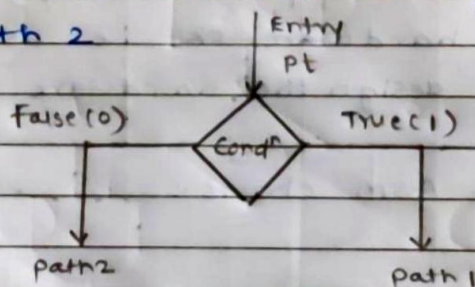
3. It is having one entry pt and one exit pt

- iv. Name of the state is placed to the left of state box.
- v. The unconditional outputs corresponding to that state can be placed inside state box.
- vi. Make state machine outputs can also be placed inside state box.



2. Decision Box:-

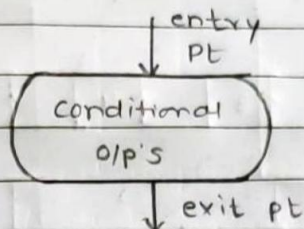
- i. Diamond shape
- ii. Having one entry pt and two exit pts.
- iii. Inputs or boolean expr. can be placed inside the decision box which are checked to be whether true or false.
- iv. IF condition is true then it will prefer path 1. Otherwise it will path 2.



3. Conditional output box:-

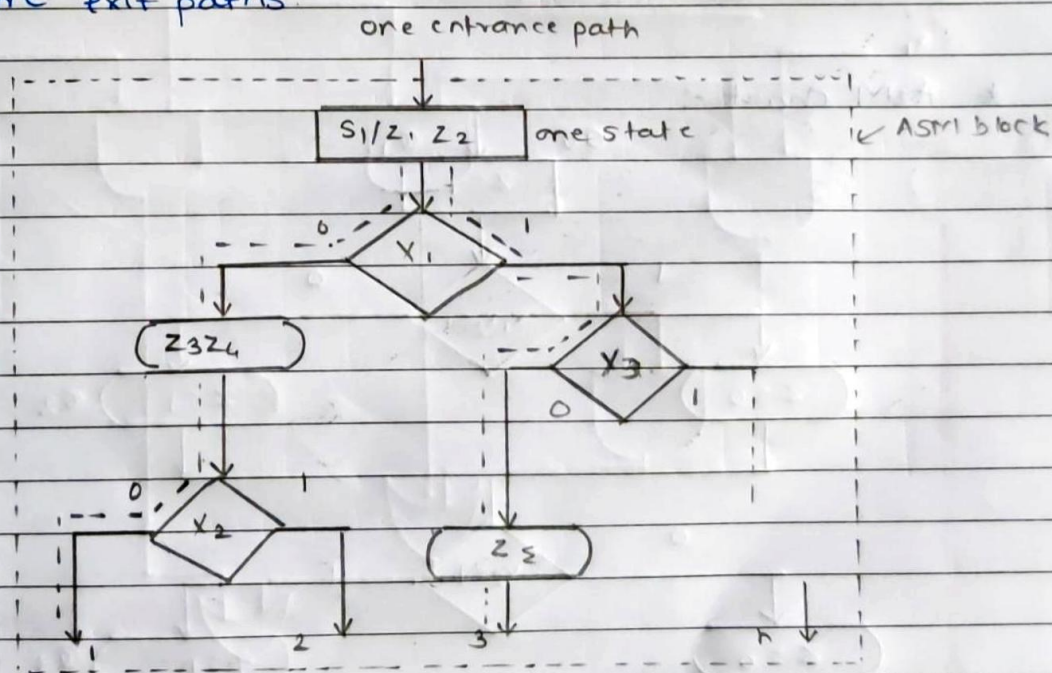
- 1. Oval shape
- 2. Having one entry pt and one exit pt. similar to state
- 3. Input path to be conditional outputs can be placed inside the statements.

- iv. The conditional o/p can be placed inside the statement.
- v. In general, mealy state machine o/p's are represented inside conditional output box.



* ASM block:-

1. It is a structure consisting of one state box and all the decision and conditional boxes connected to its exit path.
2. An ASM patch has one entrance path and one or more exit paths.

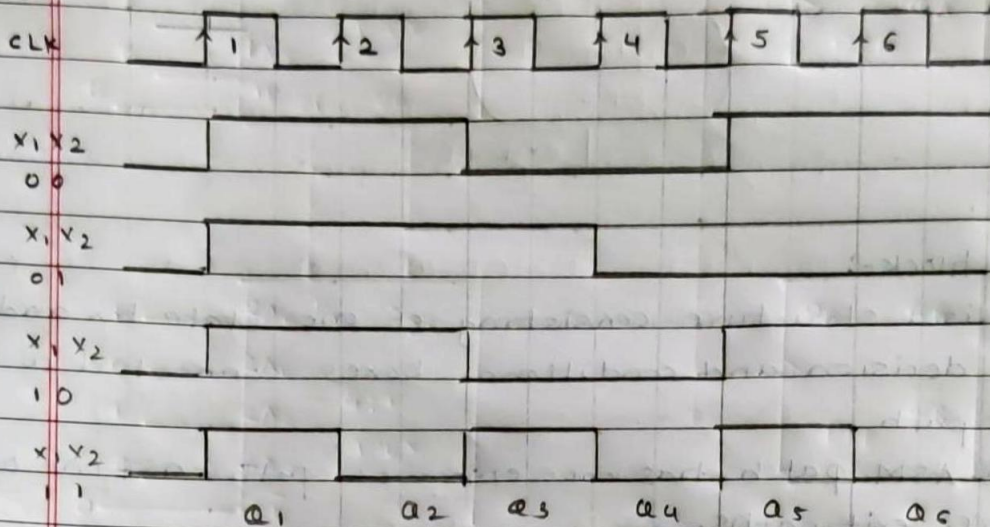


Procedure -

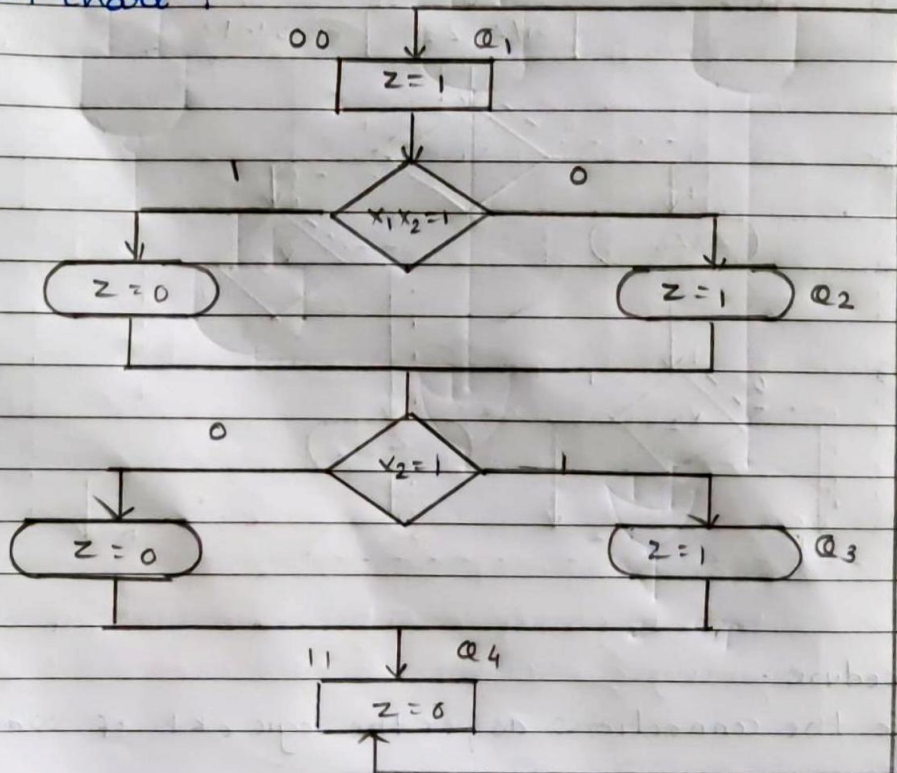
Make the connections as per the logic & waveform

generator circuit using and verify its functionality

* Design of waveform of signal generator:-



* ASM chart -1



State transition Table:-

Dec Eq ⁿ	Present state		Ext. I/P's		Next state		Mux o/p		Final o/p
	X ₁	X ₂	Q _A	Q _B	D _A	D _B	M ₁	M ₂	Z
0	0	0	0	0	0	1			1
1	0	0	0	1	1	0			1
2	0	0	1	0	1	1	0	0	0
3	0	0	1	1	0	0			0
4	0	1	0	0	0	1			1
5	0	1	0	1	1	0	0	1	1
6	0	1	1	0	1	1			1
7	0	1	1	1	0	0			0
8	1	0	0	0	0	1			1
9	1	0	0	1	1	0	1	0	1
10	1	0	1	0	1	1			0
11	1	0	1	1	0	0			0
12	1	1	0	0	0	1			1
13	1	1	0	1	1	0	1	1	0
14	1	1	1	0	1	1			1
15	1	1	1	1	0	0			0

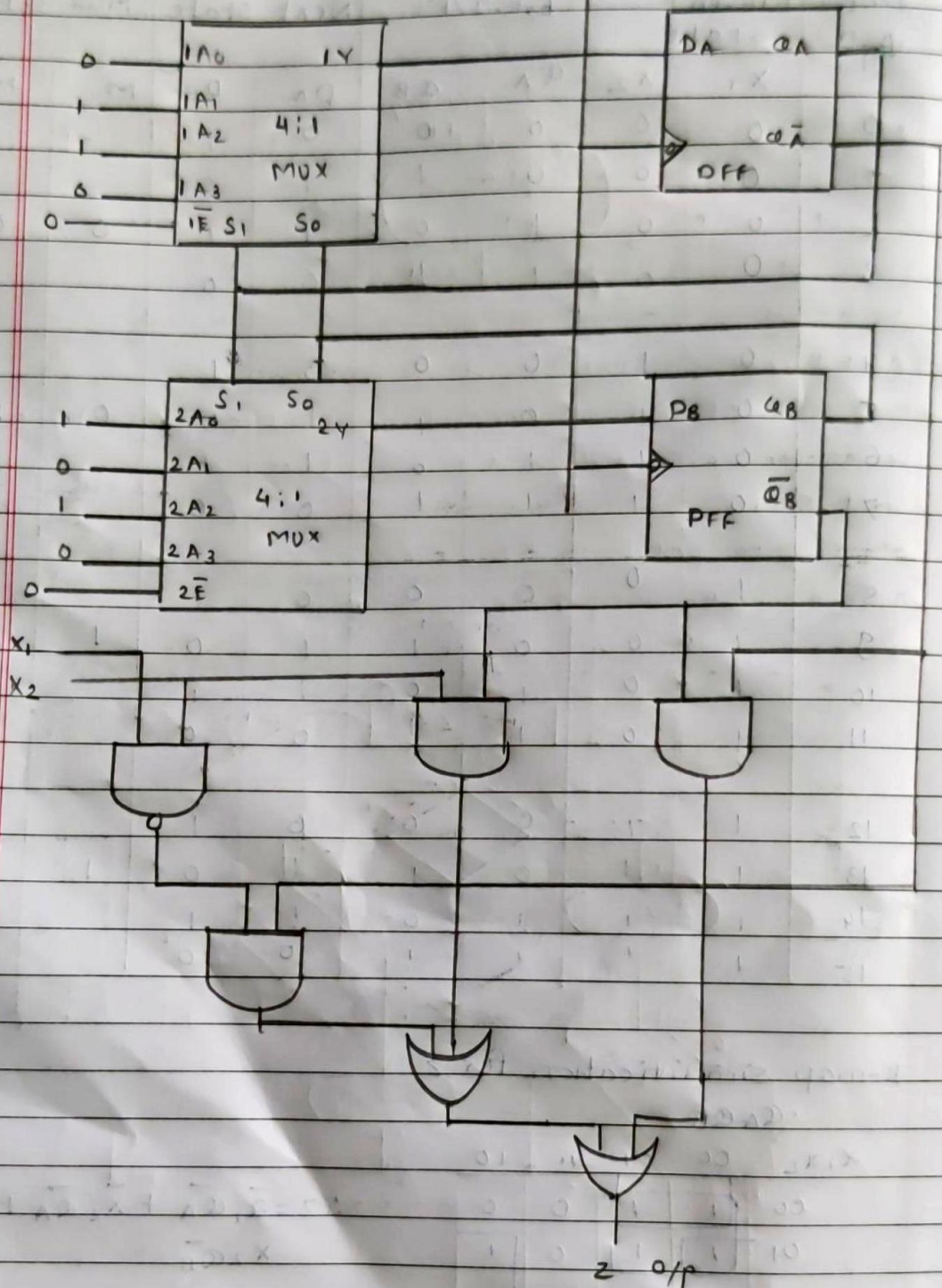
* K-map simplification for z

		Q _A Q _B			
x ₁ x ₂		00	01	11	10
00		1	1	0	0
01		1	1	0	1
11		1	0	0	1
10		1	1	0	0

$$\therefore Z = \bar{x}_1 \bar{Q}_A + \bar{x}_2 \bar{Q}_A + \bar{Q}_A \bar{Q}_B + x_2 \bar{Q}_B$$

$$\therefore Z = \bar{Q}_A \bar{Q}_B + \bar{Q}_B x_2 + \bar{Q}_A x_1 x_2$$

CLK



Logic Gates (MSI device required for implementation)

1. IC 74153 (4:1 Mux) - 2
2. IC-7475 (DUAL DFF) - 1
3. IC - 7408 (AND Gate) - 1 (4 AND gates req)
4. IC-7432 (OR gate) - 1 (2 OR gates req)
5. IC - 7404 (NOT gate) - 1 (1 NOT gates req)

Conclusion:-

Hence, algorithm state machine by multiplexer controller method was understood, designed and implemented successfully.

asm chart using mux controller method

Manish

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