Digital Logic Design (ESC-151)

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Objectives:

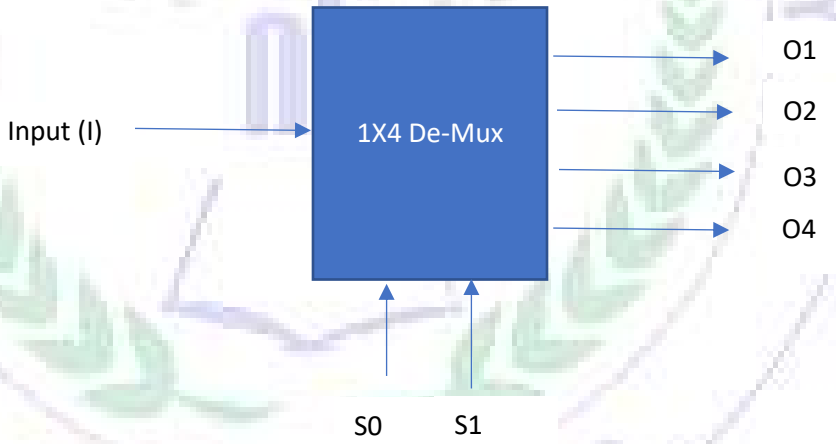
The objective for this week will be to do detailed discussion on combinational circuit designing with practice examples:

- 1x4 De- Multiplexer
- 1x8 De-Multiplexer
- Don't care conditions at input side of truth table
- Water level Indicator
- Don't care conditions at output side of truth table
- Elevator control system

LECTURE-19

DESIGN A 1x4 DE-MULTIPLEXER

Block diagram:



Truth Table:

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S_0	S_1	I	O1	O2	O3	O4
0	0	0	0	0	0	0
0	0	1	1	0	0	0
0	1	0	0	0	0	0
0	1	1	0	1	0	0
1	0	0	0	0	0	0
1	0	1	0	0	1	0
1	1	0	0	0	0	0
1	1	1	0	0	0	1

Output Equations:

O1= $s_0's_1'I$

O2=$s_o's_1I$

O3=$s_0s_1'I$

O4=s_0s_1I

Circuit Diagram:

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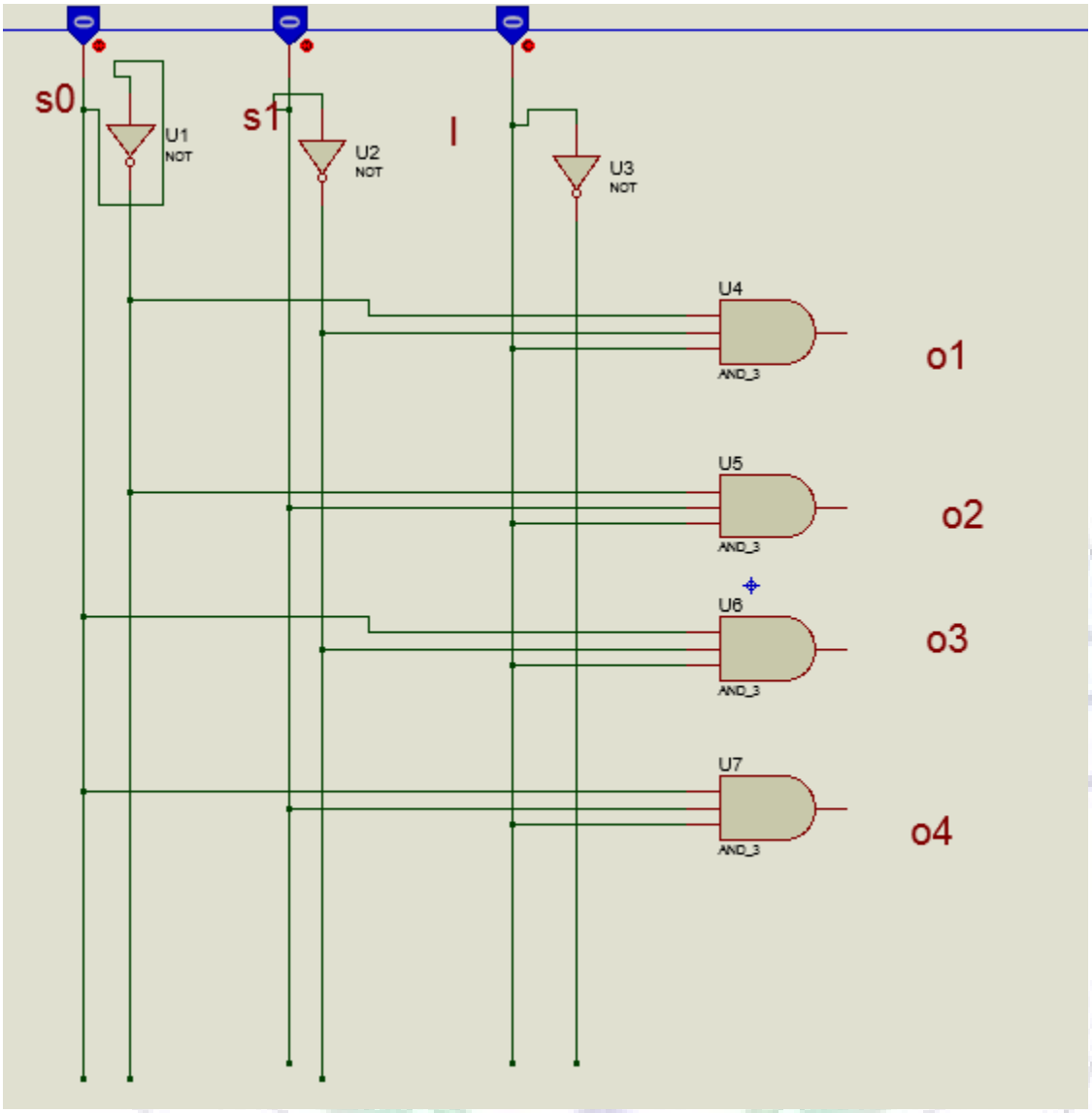

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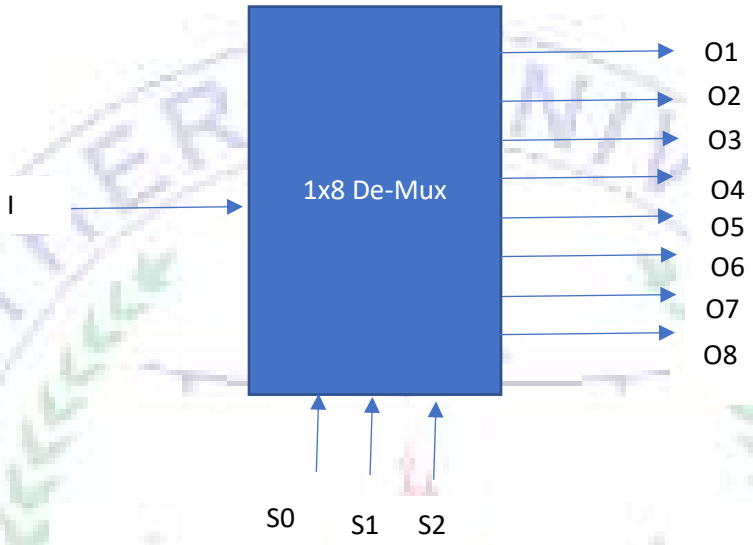
DESIGN A 1x8 DE-MULTIPLEXER

Block Diagram:



Truth Table:

S0	S1	S2	outputs	
0	0	0	I=O1	$O1=s_0's_1's_2'I$
0	0	1	I=O2	$O2=s_0's_1' s_2I$
0	1	0	I=O3	$O3=s_0's_1 s_2'I$
0	1	1	I=O4	$O4=s_0's_1 s_2I$
1	0	0	I=O5	$O5=s_0s_1' s_2'I$
1	0	1	I=O6	$O6=s_0s_1' s_2I$
1	1	0	I=O7	$O7=s_0s_1 s_2'I$
1	1	1	I=O8	$O8=s_0s_1 s_2I$

Output Equations:

O1=$s_0's_1's_2'I$

O2=$s_0's_1' s_2I$

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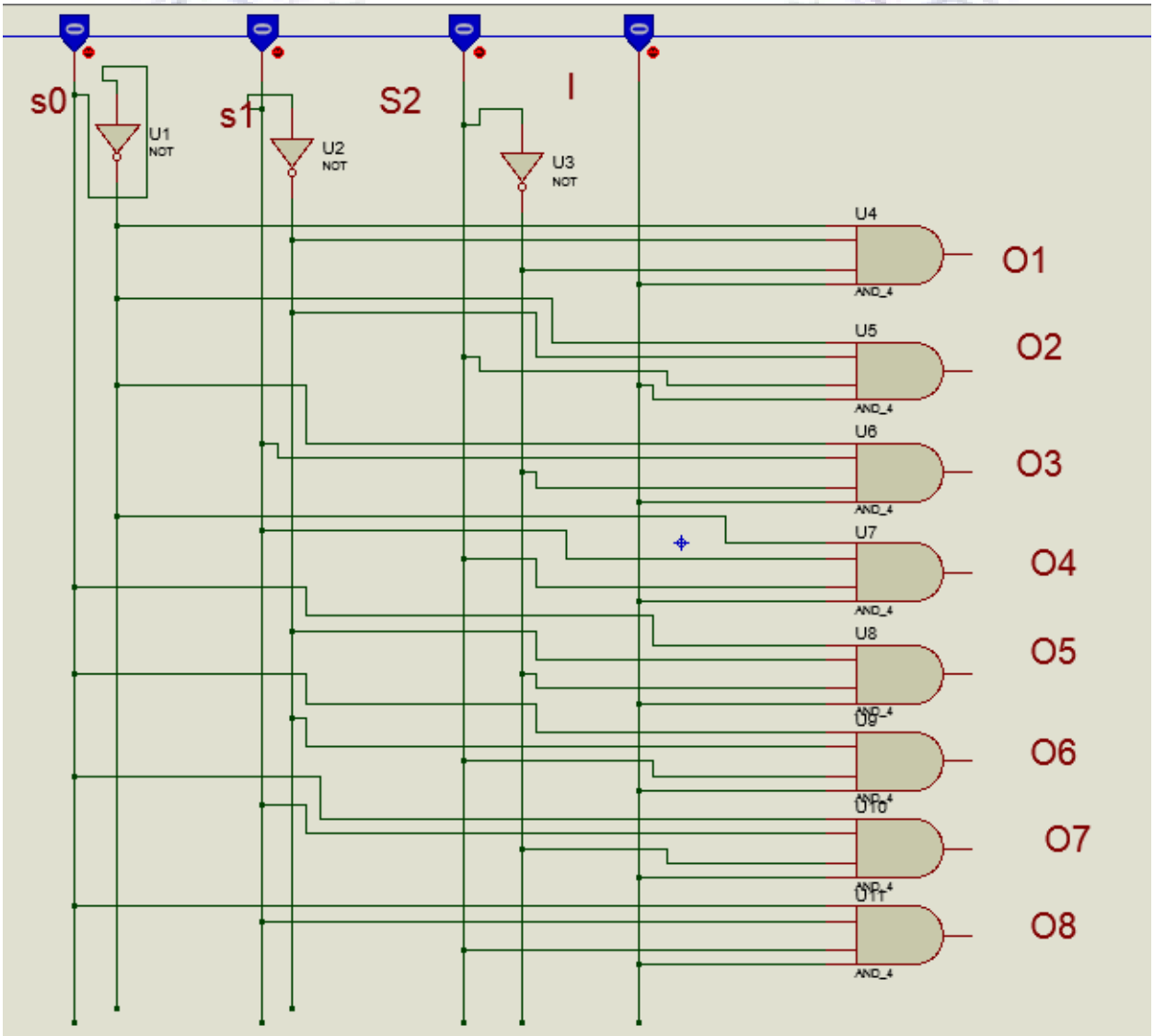
O3=$S_0'S_1\ S_2'I$
O4=$S_0'S_1\ S_2I$
O5=$S_0S_1'\ S_2'I$
O6=$S_0S_1'\ S_2I$
O7=$S_0S_1\ S_2'I$
O8=$S_0S_1\ S_2I$

Circuit Diagram:



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DON'T CARE CONDITIONS AT INPUT SIDE (PRACTICE EXAMPLES)

EXAMPLE#1

A	B	C	OUTPUT
0	0	0	1
X	1	1	1
0	x	1	1
1	x	x	1

000	X11	0x1	1xx
	011	001	100
	~~1~~11	0~~1~~1	101
			110
			111

BC / A	00	01	11	10
0	1	1	1	
1	1	1	1	1

OUTPUT= A+B'+C

EXAMPLE#2

A	B	C	OUTPUT
0	1	X	1
1	X	0	1
1	1	X	1
X	0	X	1
0	0	0	1

01X | 1X0 | 11X | X0X | 000

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010	100	110	~~000~~	
011	~~110~~	111	001	
			~~100~~	
			101	

BC / A	00	01	11	10
0	1	1	1	1
1	1	1	1	1

OUTPUT=1

EXAMPLE#3

A	B	C	D	OUTPUT
0	X	X	0	1
X	1	1	1	1
X	1	X	0	1
0	X	1	1	1
1	1	X	1	1

0XX0	X111	X1X0	0X11	11X1
0000	0111	~~0100~~	0011	1101
0010	1111	~~0110~~	~~0111~~	~~1111~~
0100		1100		
0110		1110		

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CD / AB	00	01	11	10
00	1		1	1
01	1		1	1
11	1	1	1	1
10				

OUTPUT= AB+A'D'+A'C

LECTURE-20

DESIGN A BASIC WATER LEVEL INDICATOR

Block diagram:

Truth Table:

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A	B	OUTPUT
0	0	0
0	1	1
1	0	0
1	1	X

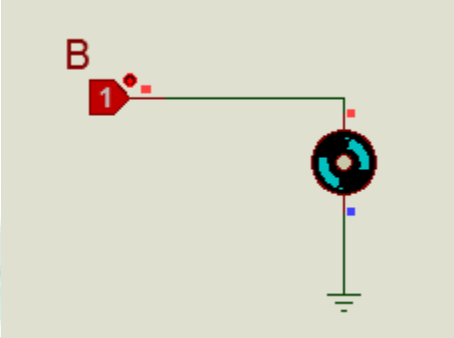
Output Equations:

B / A	0	1
0		1
1		X

Output Equation:

OUTPUT (motor)= B

Circuit Diagram:



LETS DO SOME PRACTICE OF DON'T CARE CONDITIONS AT OUTPUT:

EXAMPLE#1

A	B	C	OUTPUT
0	0	0	0

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0	0	1	1
0	1	0	X
0	1	1	X
1	0	0	1
1	0	1	1
1	1	0	0
1	1	1	X

BC / A	00	01	11	10
0		1	X	X
1	1	1	X	

OUTPUT= AB'+C

EXAMPLE#2

A	B	C	OUTPUT
0	0	0	1
0	0	1	X
0	1	0	X
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

BC / A	00	01	11	10
0	1	X	1	X
1			1	

OUTPUT= A'+BC

EXAMPLE#3

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A	B	C	D	OUTPUT
0	0	0	0	1
0	0	0	1	0
0	0	1	0	X
0	0	1	1	1
0	1	0	0	1
0	1	0	1	0
0	1	1	0	0
0	1	1	1	X
1	0	0	0	1
1	0	0	1	1
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	X
1	1	1	0	0
1	1	1	1	0

CD / AB	00	01	11	10
00	1		1	X
01	1		X	
11	1	X		
10	1	1		

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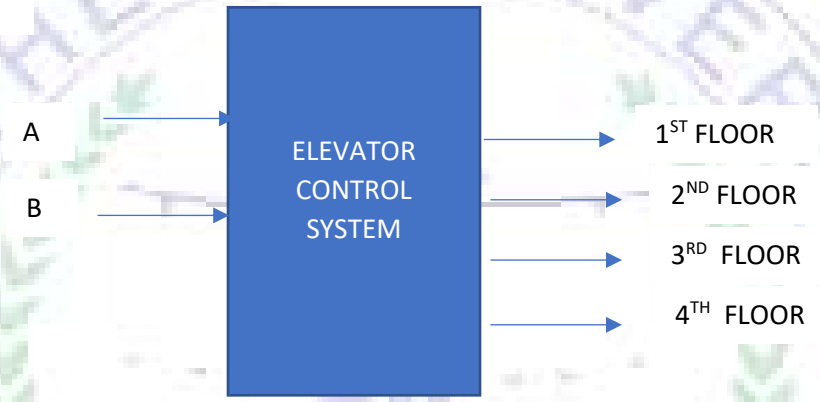
OUTPUT= C'D'+AC'+A'CD

DESIGN A BASIC ELEVATOR CONTROL SYSTEM

Block diagram:



Truth Table:

A	B	1ST FLOOR	2ND FLOOR	3RD FLOOR	4TH FLOOR
0	0	1	0	0	0
0	1	0	1	0	0
1	0	0	0	1	0
1	1	0	0	0	1

Output Equations:

1st FLOOR= A'B'

2ND FLOOR=A'B

3RD FLOOR= AB'

4TH FLOOR= AB

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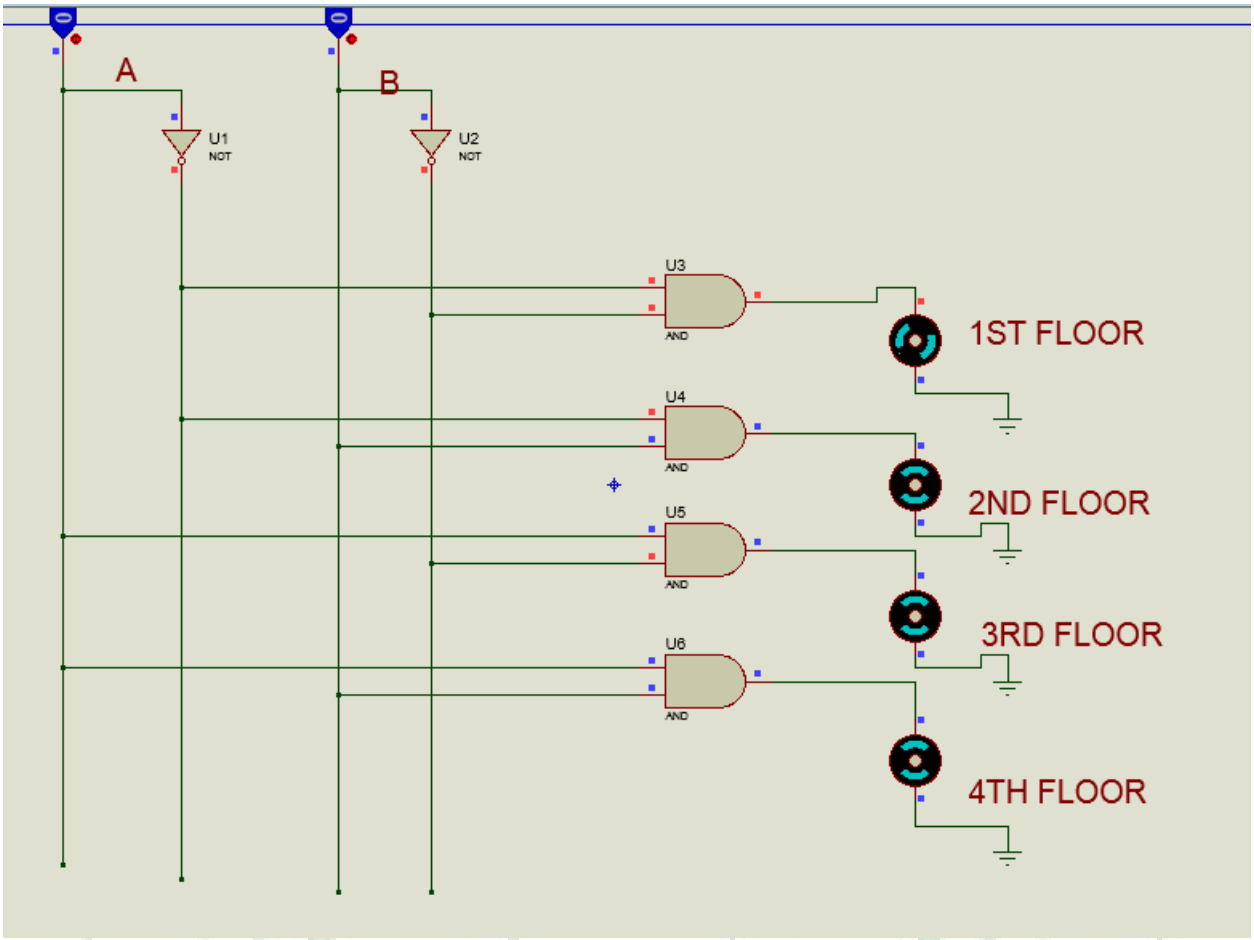
Circuit Diagram:



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Assignment:10

Dear students read the given lectures carefully as per the course objectives mentioned on the top and carryout the assignment as per following instructions

Task to do:

Draw 10 random truth tables with 3,4 and 5 variables for your self, place don't care at inputs and outputs 5 each. Solve them and submit your assignment

Reference Material:

Lesson plans

Text book: Digital design by Moris Mano 4th edition

Also see digital fundamentals 8th ed by Floyd

Lecture Video Links:

Part-1: https://youtu.be/jztGSeYMb28

Part-2: https://youtu.be/2cd6jiDI-xc

Part-3: https://youtu.be/urfQxDR7i6o

Part-4: https://youtu.be/TPe8JcbQzEQ

Lab Work: https://youtu.be/F0fn2OKpxdA

LAB Work:

Design any 3circuits of given assignments on proteus and send screenshots to Mr Hamza Sakhi via email at **hamzasakhic97@gmail.com**

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Lab manuals have been uploaded on watsapp and Edmodo library section.