Assignment 2

Class- SE IV
Batch- F4

Roll NO - 21430
DOS:

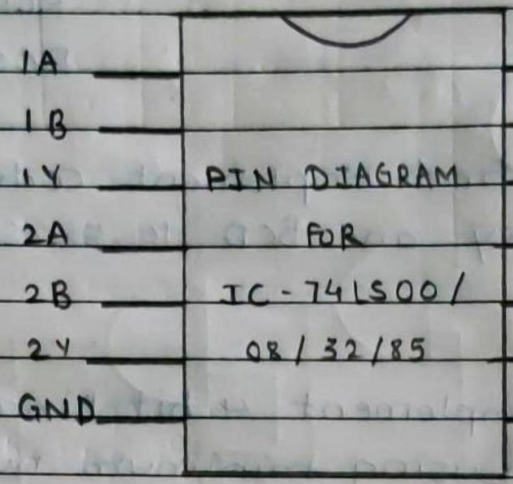
Title - Design and implement code convertor Binary to gray and BCD to Excess-3.

Objective:-
1. Design and implement 4 bit binary to gray code converter using minimum number of logic gates and vice-versa
2. Design and implement excess-3 to BCD code converter using minimum number of logic gates and vice-versa.

Apparatus:- Digital board, GP-4 patch cords. IC-74LS86, IC 74LS32, IC-74LS08 / IC-74LS04 and required logic gates if any

Theory- Code converter is combinational logic circuits which can be used to convert one number system to another. Binary code is a weighted code having base 2. Gray code is code in which one in which bit change is obtained. Gray code BCD is 4 bit code but it is valid from 0 to 9 Excess-3 are valid from 3 to 15. Excess 3 is non-weighted code. It is sequential or self. Complementary code.

Pin Diagram:-



Procedure-:

1. Make the connections as per the logic circuit of 4 bit binary to 4 bit gray code converter and vice-versa and verify the truth table.
2. Make the connections as per the logic circuit of 4 bit BCD to 4 bit Excess-3 code converter and vice-versa and verify the truth Table.

* Design of 4 bit binary to gray code:-

* Truth Table :-

Dec. Eq	Binary code Input				Gray code output			
	B3	B2	B1	B0	G3	G2	G1	G0
1	0	0	0	0	0	0	0	0
2	0	0	0	1	0	0	0	1
3	0	0	1	0	0	0	1	1
4	0	0	1	1	0	0	1	0
5	0	1	0	0	0	1	1	0
6	0	1	0	1	0	1	1	1
7	0	1	1	0	0	1	0	1
8	0	1	1	1	0	1	0	0
9	1	0	0	0	1	1	0	0
10	1	0	0	1	1	1	0	1
11	1	0	1	0	1	1	1	1
12	1	0	1	1	1	1	1	0
13	1	1	0	0	1	0	1	0
14	1	1	0	1	1	0	1	1
15	1	1	1	0	1	0	0	1
16	1	1	1	1	1	0	0	0

* K-Map Simplification for G3, G2, G1, G0.

B_3B_2 \ B_1B_0	00	01	11	10
00	0	0	0	0
01	0	0	0	0
11	1	1	1	1
10	1	1	1	1

$G_3 = B_3$

B_3B_2 \ B_1B_0	00	01	11	10
00	0	0	1	1
01	1	1	0	0
11	1	1	0	0
10	0	0	1	1

$G_1 = B_2 \oplus B_1$

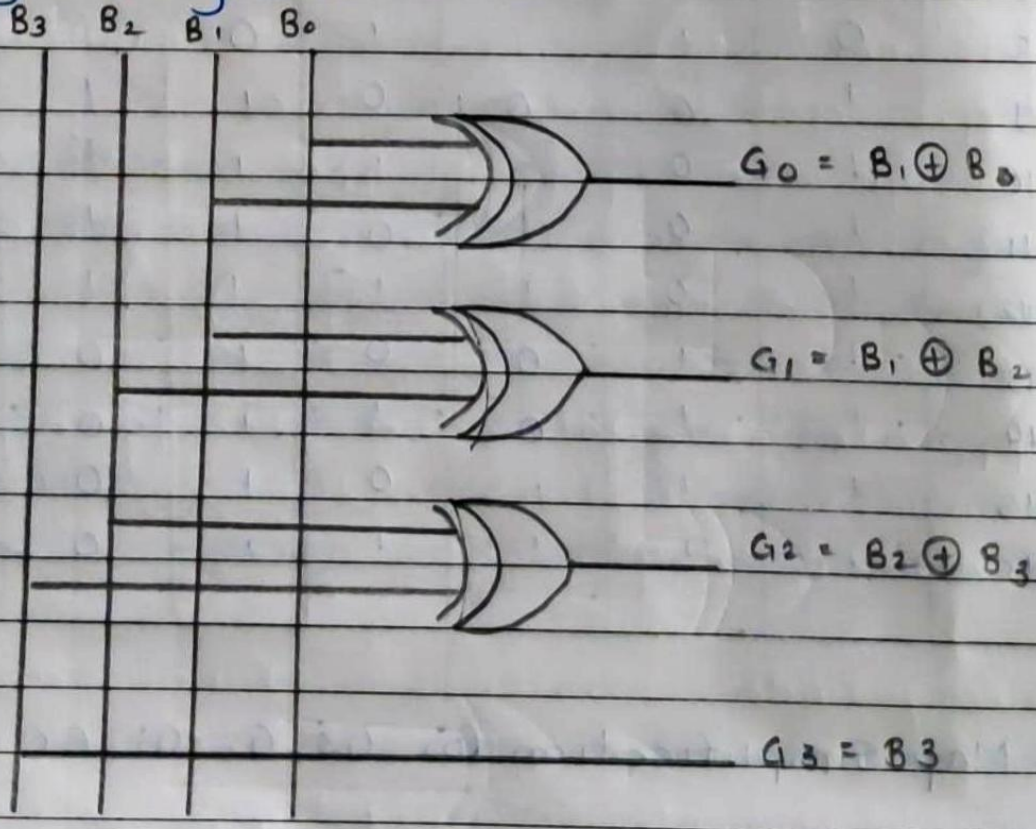
B_3B_2 \ B_1B_0	00	01	11	10
00	0	0	0	0
01	1	1	1	1
11	0	0	0	0
10	1	1	1	1

$G_2 = B_3 \oplus B_2$

B_3B_2 \ B_1B_0	00	01	11	10
00	0	1	0	1
01	0	1	0	1
11	0	1	0	1
10	0	1	0	1

$G_0 = B_1 \oplus B_2$

* Logic Diagram :-



* Design of BCD code to Excess-3 Converter

NO	Input BCD code				output Excess-3 code			
	B3	B2	B1	B0	E3	E2	E1	E0
1	0	0	0	0	0	0	1	1
2	0	0	0	1	0	1	0	0
3	0	0	1	0	0	1	0	1
4	0	0	1	1	0	1	1	0
5	0	1	0	0	0	1	1	1
6	0	1	0	1	1	0	0	0
7	0	1	1	0	1	0	0	1
8	0	1	1	1	1	0	1	0
9	1	0	0	0	1	0	1	1
10	1	0	0	1	1	1	0	0
11	1	0	1	0	1	1	0	1
12	1	0	1	1	1	1	1	0
13	1	1	0	0	1	1	1	
14	1	1	0	1	x	x	x	x
15	1	1	1	0	x	x	x	x
16	1	1	1	1	x	x	x	x

* K-Map.

B_3B_2 \ B_1B_0	00	01	11	10
00				
01		1	1	1
11	1	x	x	x
10	1	1	1	1

$E_3 = B_2(B_0 + B_1) + B_3$

B_3B_2 \ B_1B_0	00	01	11	10
00		1	1	1
01	1			
11	1	x	x	x
10		1	1	1

$E_2 = \bar{B}_1(B_0 + B_1) + \bar{B}_0\bar{B}_1\bar{B}_2$

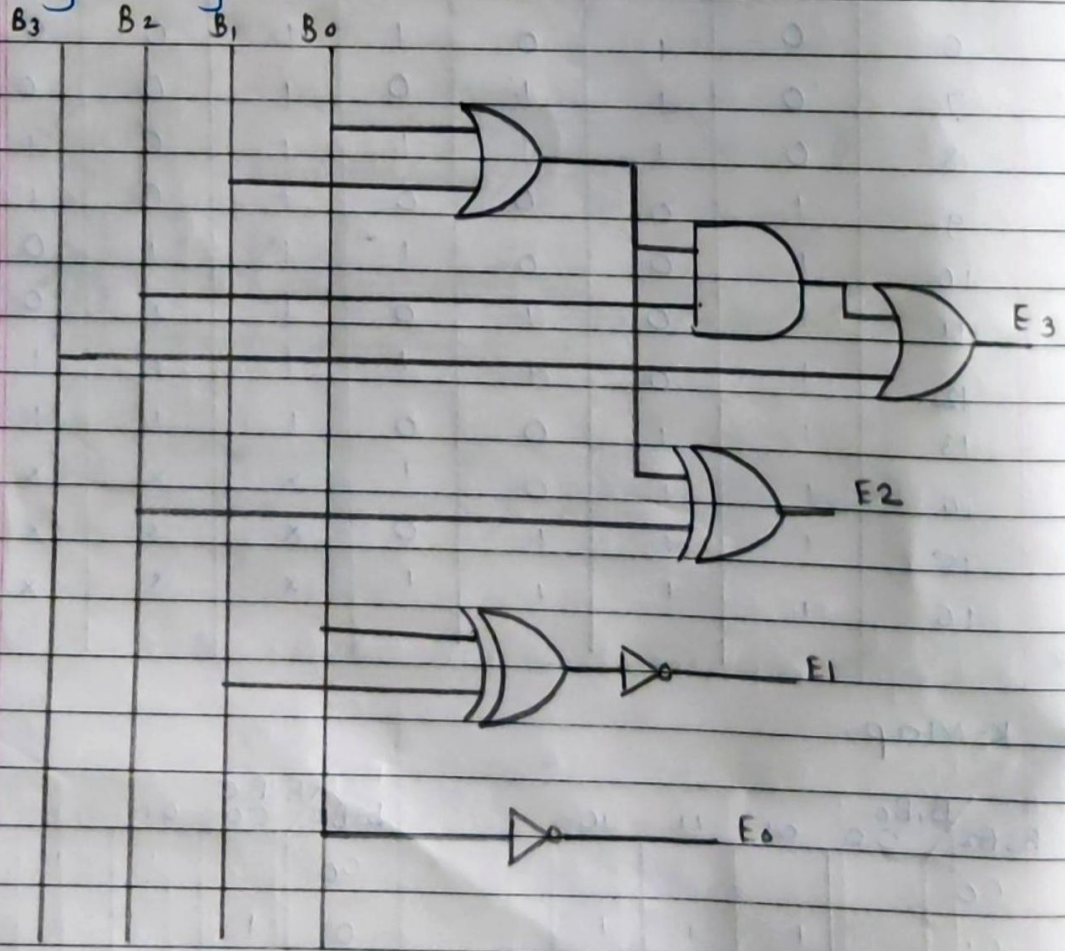
B_3B_2 \ B_1B_0	00	01	11	10
00	1		1	
01	1		1	
11	1	x	x	x
10	1		1	

$$E_1 = B_2(B_0 + B_1) + B_3$$

B_3B_2 \ B_1B_0	00	01	11	10
00	1			1
01	1			1
11	1	x	x	x
10	1			1

$$E_0 = \bar{B_0}$$

* Logic Diagram :-



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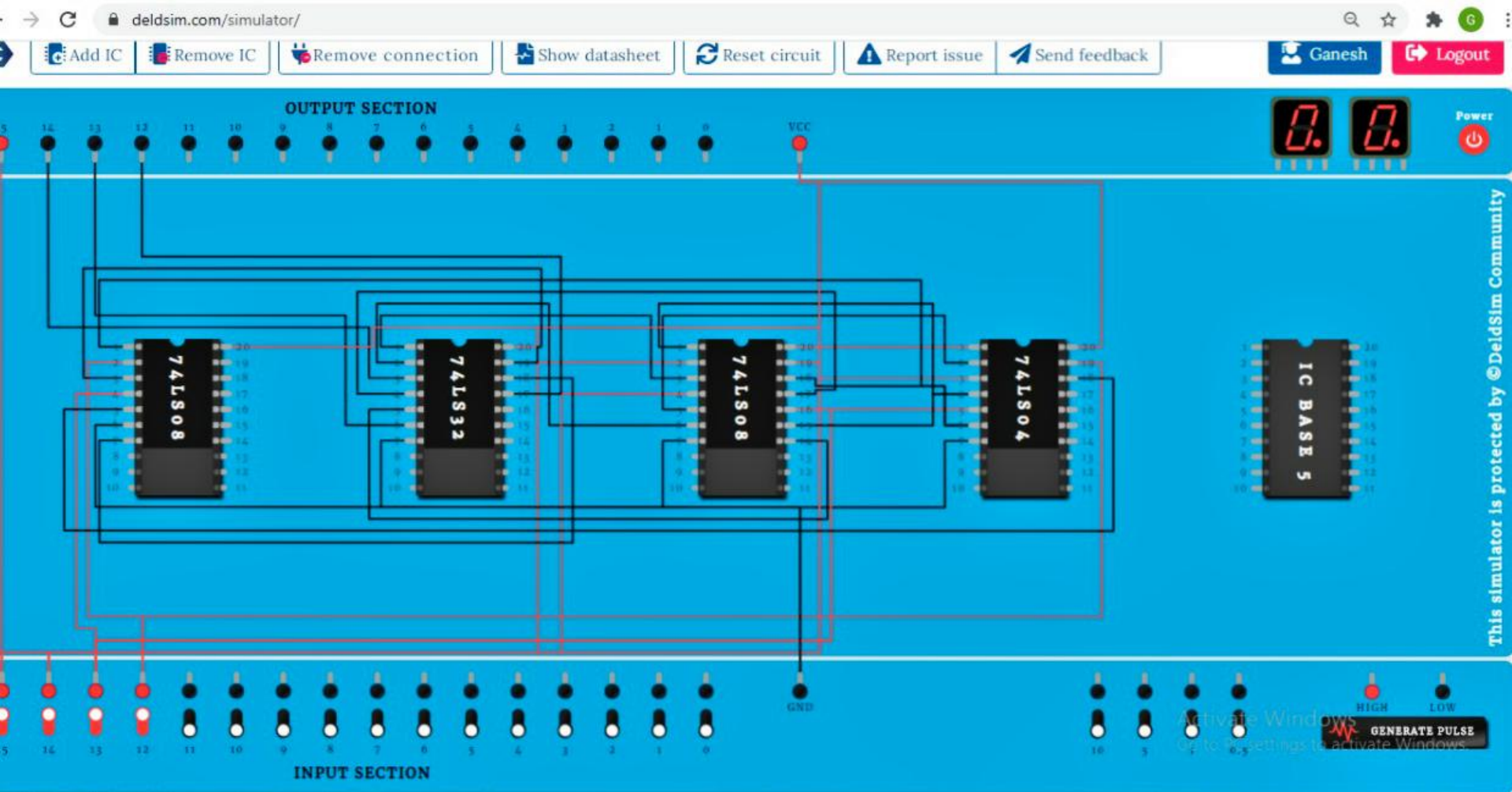
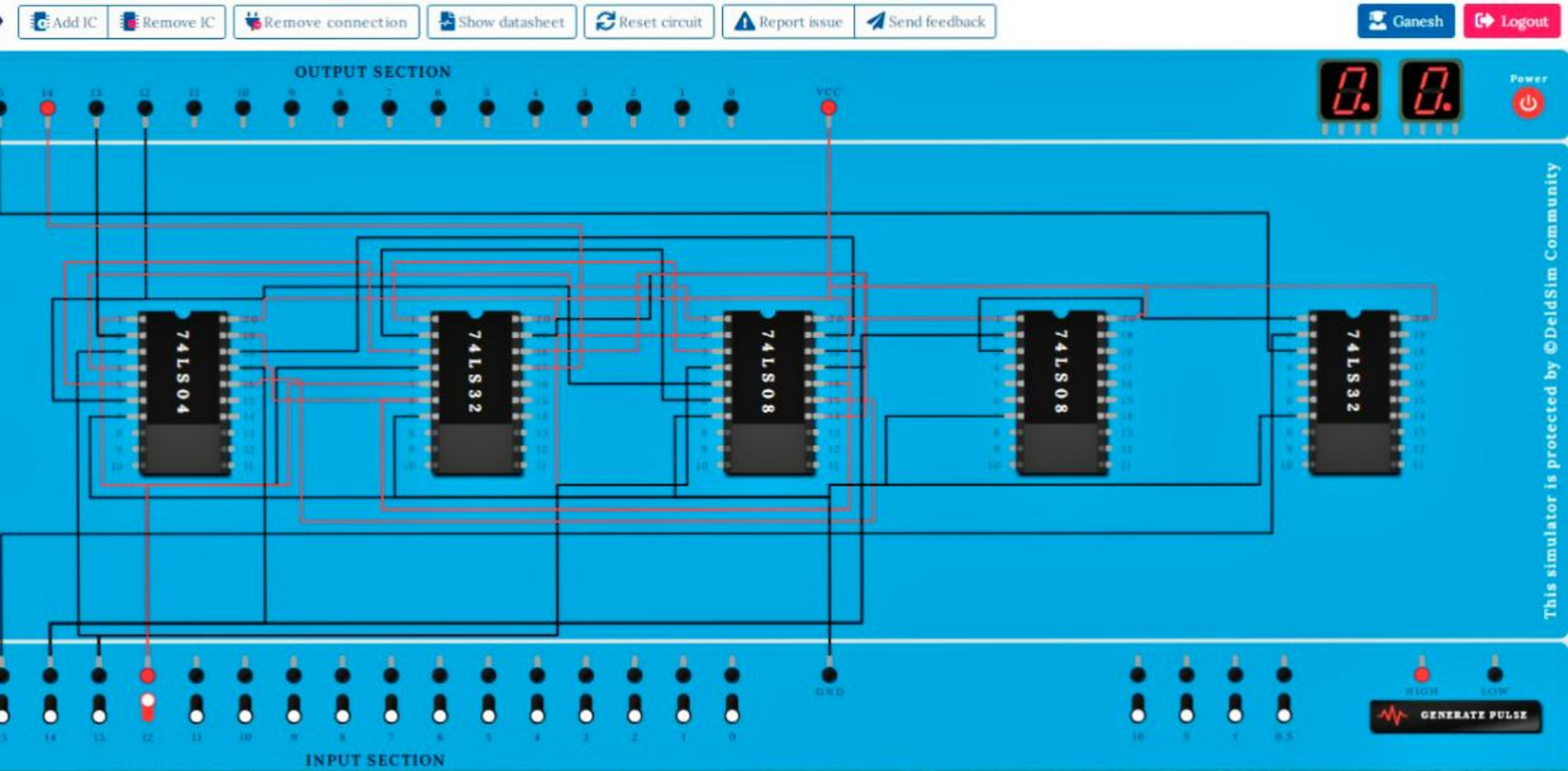
Logic gates / MSI device required for.

NO.	Title.	Name of IC	NO. of gates	IC required
1.	Binary to gray code	EX-OR	3	74LS86
2.	BCD to excess -3	NOT	2	74LS04
		Ex-OR	2	74LS86
		AND	1	74LS08
		OR	2	74LS32

Conclusion -:

Succesfully implemented Binary to Gray code Converter and BCD to Excess-3 code converter on an online digital trainer kit.


deldsim.com/simulator/
Add IC
Remove IC
Remove connection
Show datasheet
Reset circuit
Report issue
Send feedback
Ganesh
Logout
OUTPUT SECTION
VCC
Power
74LS08
74LS32
74LS08
74LS04
IC BASE 5
This simulator is protected by ©DeldSim Community
GND
HIGH
LOW
GENERATE PULSE
INPUT SECTION
Activate Windows
Go to Settings to activate Windows.


Add IC
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74LS08
74LS08
74LS32
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GND
HIGH
LOW
GENERATE PULSE
INPUT SECTION