Experiment No. 2

Title: Design and Simulate binary to gray, gray to binary, BCD to Excess 3, Excess 3 to BCD code converters using Vlab.

Name: Chandana Ramesh Galgali **Batch: B-1** **Roll No.: 16010422234**

Experiment No.: 2

Aim: To Design and Simulate binary to gray, gray to binary, BCD to Excess 3, Excess 3 to BCD code converters using Vlab.

Resources needed: internet connection,

Access to- https://he-coep.vlabs.ac.in/exp/various-code-converters/index.html

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Theory:
Explain following points in brief

1. **Binary Codes**
2. **BCD Code**
3. **Excess 3 Code**
4. **Gray Code**
5. **Code converter**

Explore the Theory and lab Manual in References section of the Vlab experiment

Procedure:

a) Appear for Pretest and include the screenshot in write-up.
b) Design a Binary to Gray code Converter using pen & paper. Include scanned copy of design in write up.
c) Go through Procedure Tab.
d) Explore Simulator as per instructions in Procedure include screenshot of every circuit simulated in the writeup.
e) Appear for Posttest and include screenshot in write-up.
f) Create a document with screenshots mentioned above, Outcome and Conclusion.
g) Please note every document uploaded as Lab Writeup should be labelled as Exp_<No>_<RollNo.pdf

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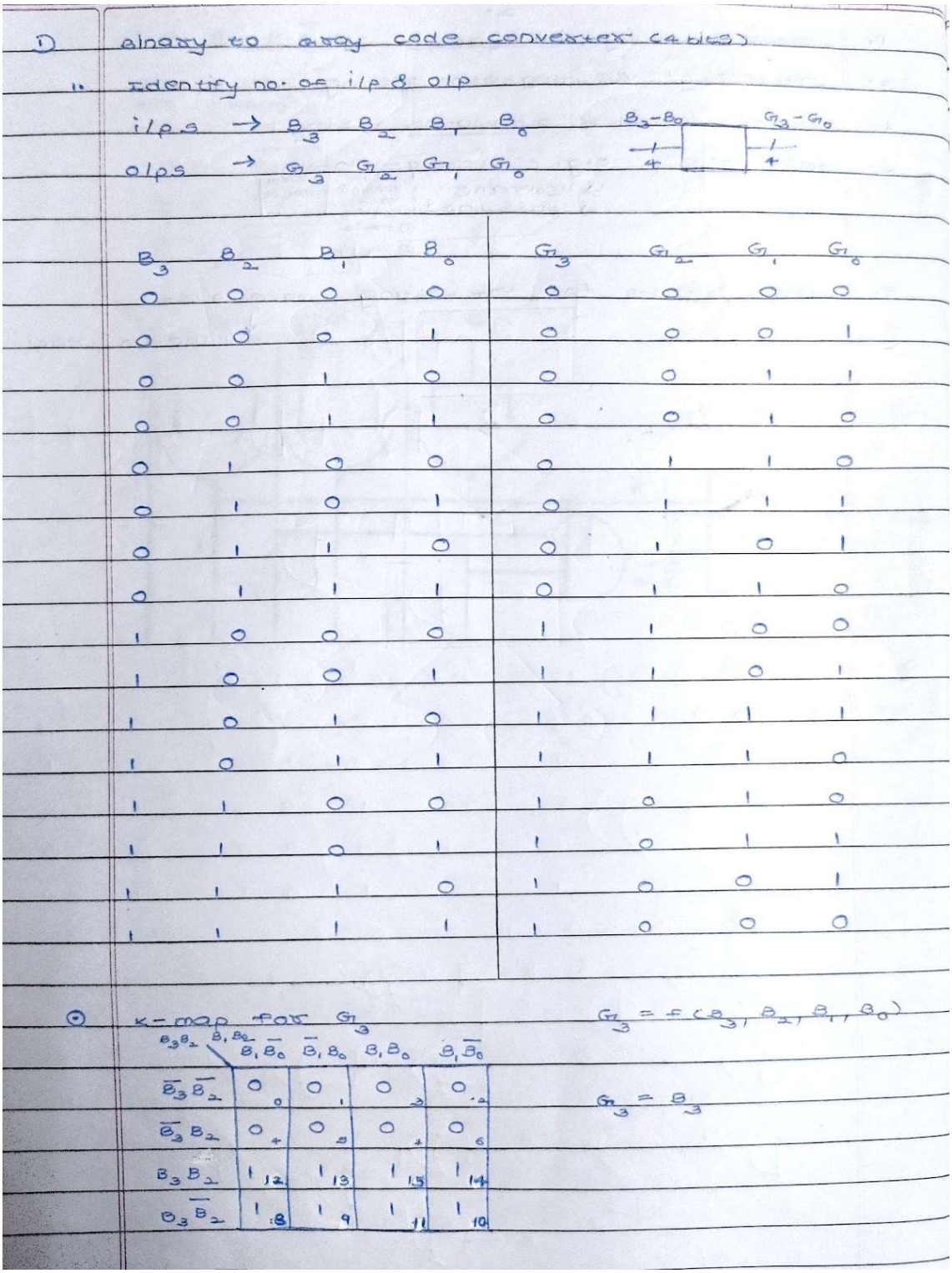
Observations and Results:

A. Design of 4 bit Binary to Gray Code converter.



1) Binary to Gray code converter (4 bits)

1. Identify no. of i/p & o/p

i/p's → B_3 B_2 B_1 B_0

o/p's → G_3 G_2 G_1 G_0

$B_3 - B_0$: 4 | $G_3 - G_0$: 4

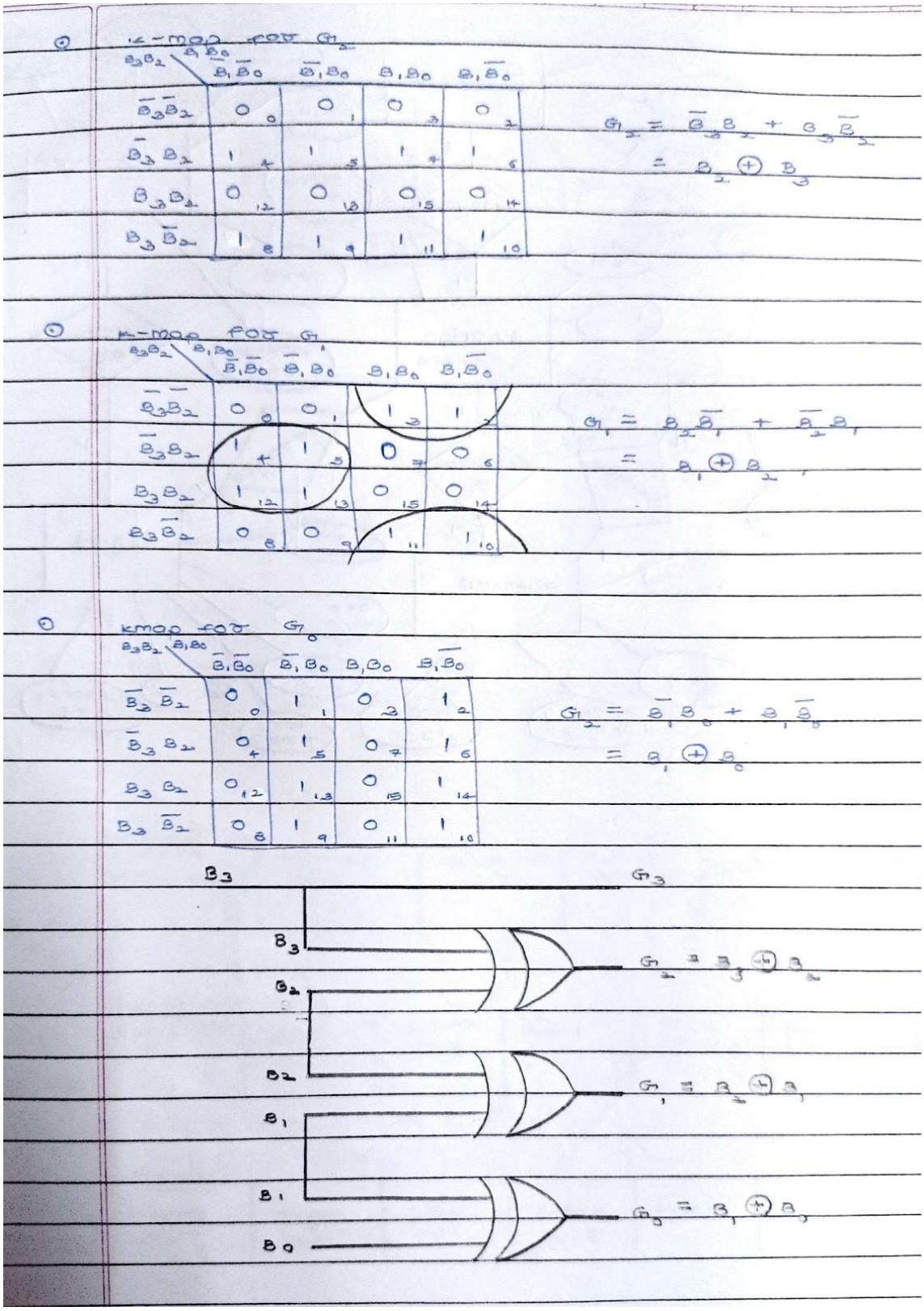
B_3	B_2	B_1	B_0	G_3	G_2	G_1	G_0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	0
0	1	0	1	0	1	1	1
0	1	1	0	0	1	0	1
0	1	1	1	0	1	1	0
1	0	0	0	1	1	0	0
1	0	0	1	1	1	0	1
1	0	1	0	1	1	1	1
1	0	1	1	1	1	1	0
1	1	0	0	1	0	1	0
1	1	0	1	1	0	1	1
1	1	1	0	1	0	0	1
1	1	1	1	1	0	0	0

2) K-map for G_3

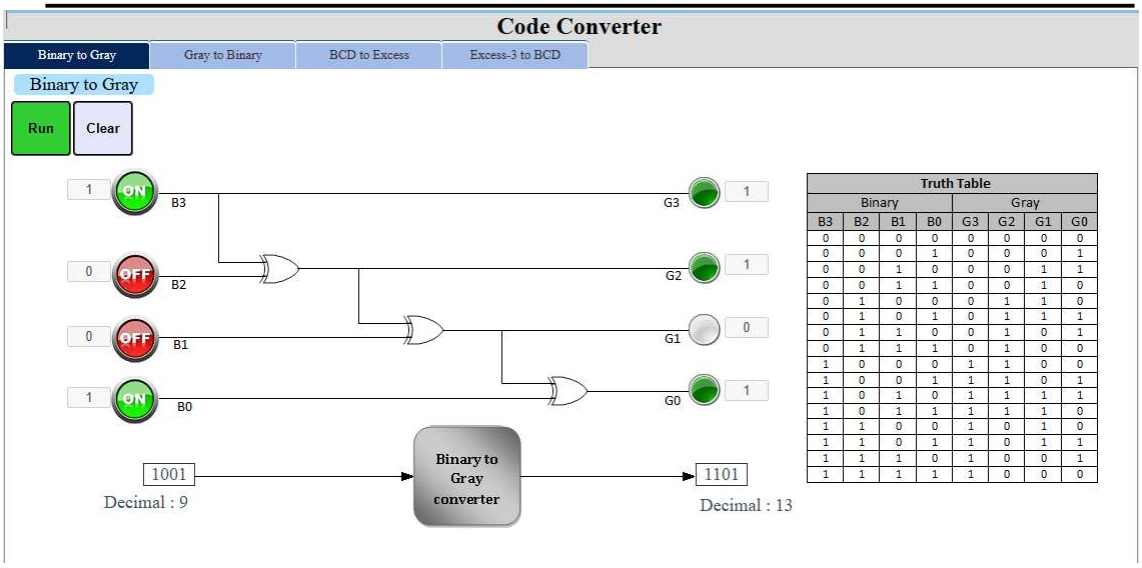
$G_3 = f(B_3, B_2, B_1, B_0)$

B_3B_2 \ B_1B_0	$\bar{B}_1\bar{B}_0$	$\bar{B}_1B_0$	B_1B_0	$B_1\bar{B}_0$
$\bar{B}_3\bar{B}_2$	0 (0)	0 (1)	0 (3)	0 (2)
$\bar{B}_3B_2$	0 (4)	0 (5)	0 (7)	0 (6)
B_3B_2	1 (12)	1 (13)	1 (15)	1 (14)
$B_3\bar{B}_2$	1 (8)	1 (9)	1 (11)	1 (10)

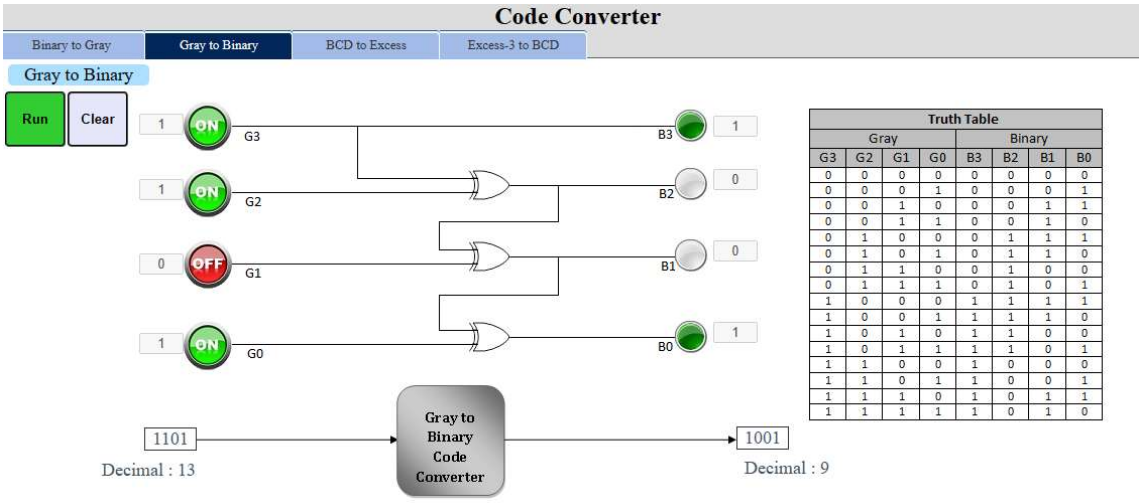
$G_3 = B_3$


K-map for G2
K-map for G1
kmap for G0
B3
B2
B1
B0
G3
G2
G1
G0

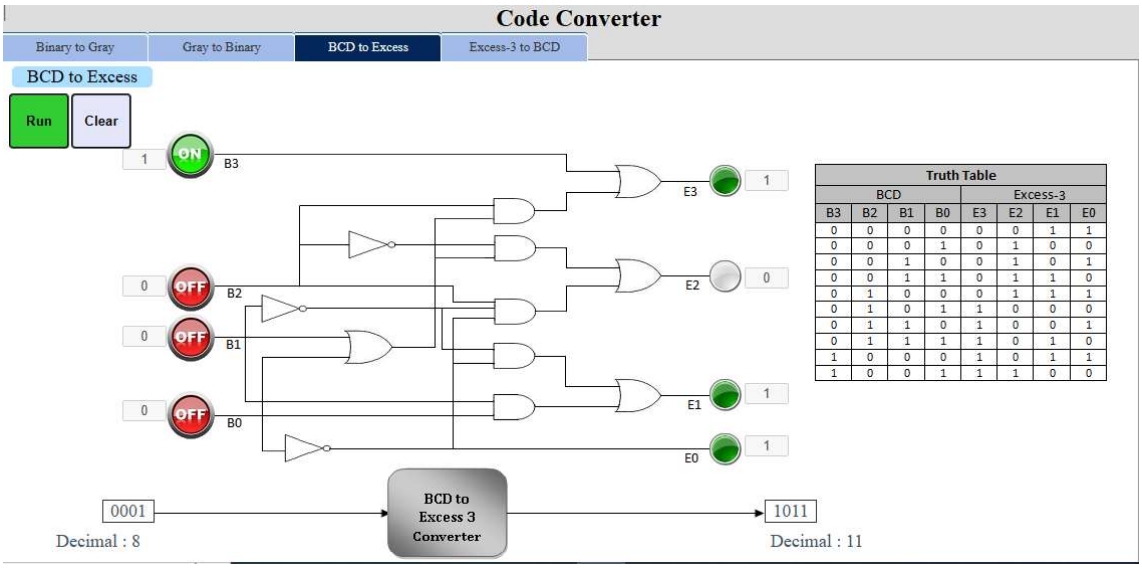
B. Observe and understand the simulated code converters.



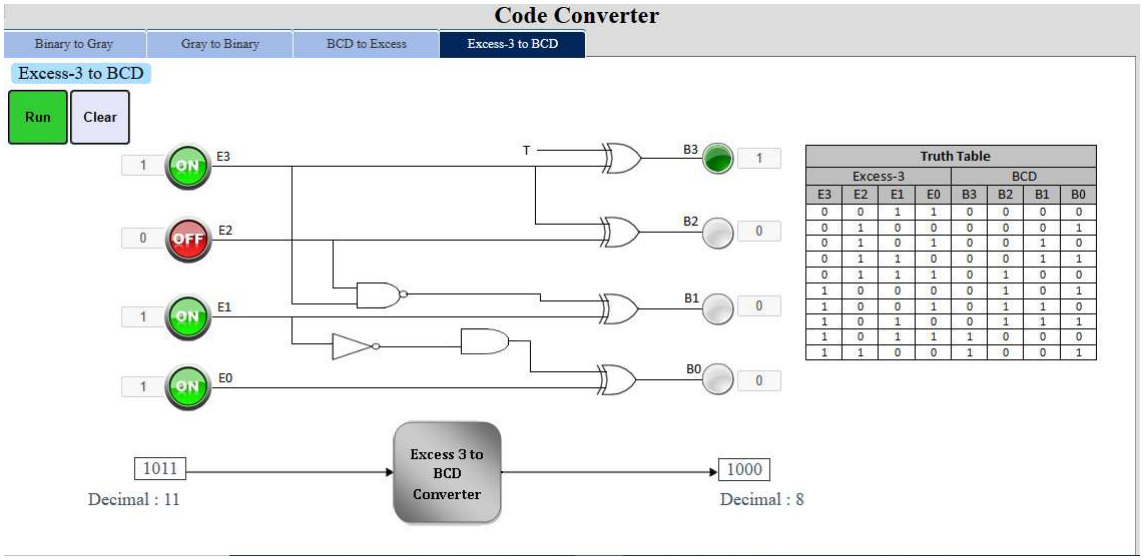
Truth Table							
Binary				Gray			
B3	B2	B1	B0	G3	G2	G1	G0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	0
0	1	0	1	0	1	1	1
0	1	1	0	0	1	0	1
0	1	1	1	0	1	0	0
1	0	0	0	1	1	0	0
1	0	0	1	1	1	0	1
1	0	1	0	1	1	1	1
1	0	1	1	1	1	1	0
1	1	0	0	1	0	1	0
1	1	0	1	1	0	1	1
1	1	1	0	1	0	0	1
1	1	1	1	1	0	0	0



Truth Table							
Gray				Binary			
G3	G2	G1	G0	B3	B2	B1	B0
0	0	0	0	0	0	0	0
0	0	0	1	0	0	0	1
0	0	1	0	0	0	1	1
0	0	1	1	0	0	1	0
0	1	0	0	0	1	1	1
0	1	0	1	0	1	1	0
0	1	1	0	0	1	0	0
0	1	1	1	0	1	0	1
1	0	0	0	1	1	1	1
1	0	0	1	1	1	1	0
1	0	1	0	1	1	0	0
1	0	1	1	1	1	0	1
1	1	0	0	1	0	0	0
1	1	0	1	1	0	0	1
1	1	1	0	1	0	1	1
1	1	1	1	1	0	1	0



Truth Table							
BCD				Excess-3			
B3	B2	B1	B0	E3	E2	E1	E0
0	0	0	0	0	0	1	1
0	0	0	1	0	1	0	0
0	0	1	0	0	1	0	1
0	0	1	1	0	1	1	0
0	1	0	0	0	1	1	1
0	1	0	1	1	0	0	0
0	1	1	0	1	0	0	1
0	1	1	1	1	0	1	0
1	0	0	0	1	0	1	1
1	0	0	1	1	1	0	0



Outcomes: Solve problems on various number systems, Boolean algebra and graphical techniques.

Conclusion:
We could successfully design and simulate binary to gray, gray to binary, BCD to Excess 3, Excess 3 to BCD code converters using Vlab.

Post-Test:

The decimal number 6 in Excess-3 is written as
- a: 1101
- b: 1001
- c: 0011
- d: 1111

If each successive code differs its preceding code by a single bit only, then this code is called
- a: BCD
- b: Gray
- c: Weighted Code
- d: Primary

Gray code of binary '0000' is
- a: 0000
- b: 0001
- c: 0010
- d: 1000

The decimal number 279 will be represented in Excess-3 code as
- a: 100010111
- b: 001001111001
- c: 010110111100
- d: 100011010

The binary code of a gray code 1000 is
- a: 0001
- b: 0011
- c: 1000
- d: 1111

Submit Quiz

5 out of 5

Grade: AA / AB / BB / BC / CC / CD /DD

Signature of faculty in-charge with date

References:
Books/ Journals/ Websites:

1. R. P. Jain, “Modern Digital Electronics”, Tata McGraw Hill.
2. https://he-coep.vlabs.ac.in/exp/various-code-converters/index.html
3. https://he-coep.vlabs.ac.in/exp/various-code-converters/images/Lab%20Manual%20Exp%20code%20converter.pdf