4-BIT MULTIPLIER WITH INNOVATION

Project Report

Subject: EC-262 DIGITAL ELECTRONICS

BACHELOR OF TECHNOLOGY IN

INFORMATION TECHNOLOGY

4th Semester

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CANDIDATE'S DECLARATION

We Varun Kumar, Roll No – 2K19/IT/140 & Yashit Kumar, Roll No - 2K19/IT/149, students of B.Tech. (INFORMATION TECHNOLOGY), hereby declare that the project Dissertation titled "4-Bit Multiplier With Innovation" which is submitted by us to the Department of INFORMATION TECHNOLOGY, Delhi Technological University, Delhi in partial fulfillment of the requirement for the award of the 4th semester of the Bachelor of Technology, is made by us. This work has not previously formed the basis for the award of any Degree, Diploma Associateship, Fellowship or other similar title or recognition.

Place: Delhi

Date: 29-05-2021

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Yashit Kumar

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CERTIFICATE

I hereby certify that the Project: "**4-Bit Multiplier With Innovation**" which is submitted by Varun Kumar, Roll No – 2K19/IT/140 & Yashit Kumar, Roll No – 2K19/IT/149, INFORMATION TECHNOLOGY, Delhi Technological University, Delhi in fulfillment of the requirement for the 4th semester of Bachelor of Technology, is record of the project work carried out by the students under my supervision. To the best of my knowledge this work has not been submitted in part or full for any Degree or Diploma to this University or elsewhere.

Place: Delhi **Supervisor** : Dr. M S Choudhry

Date: 29-May-2021

DEPARTMENT OF INFORMATION TECHNOLOGY

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ACKNOWLEDGEMENT

We would like to convey our heartfelt thanks to our supervisor Dr. M S Choudhry for his ingenious ideas, tremendous help and cooperation.

We are extremely grateful to our friends who gave valuable suggestions and guidance for completion of our project. The cooperation and healthy criticism came handy and useful with them.

Finally we would like to thank all the above mentioned people once again.

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INTRODUCTION

- A Binary Multiplier is a digital combinational circuit used for multiplying two binary numbers .

- Multiplication of binary numbers is performed in the same way as multiplication of decimal numbers.

- We have designed a array multiplier which gives product of two 4 bit numbers ie 8-bit product output.

- We have also added some components such as "Hexadecimal to binary Encoder" to take input in decimal values from (0-15).

- We have also added the "7-segment display" to display the input values we choose as our Multiplicand and Multiplier.

COMPONENTS USED

1) LOGIC GATES

2) FULL ADDERS

3) HEXADECIMAL TO BINARY ENCODER

4) BINARY TO BCD CONVERTOR

5) BCD TO 7-SEGMENT DECODER

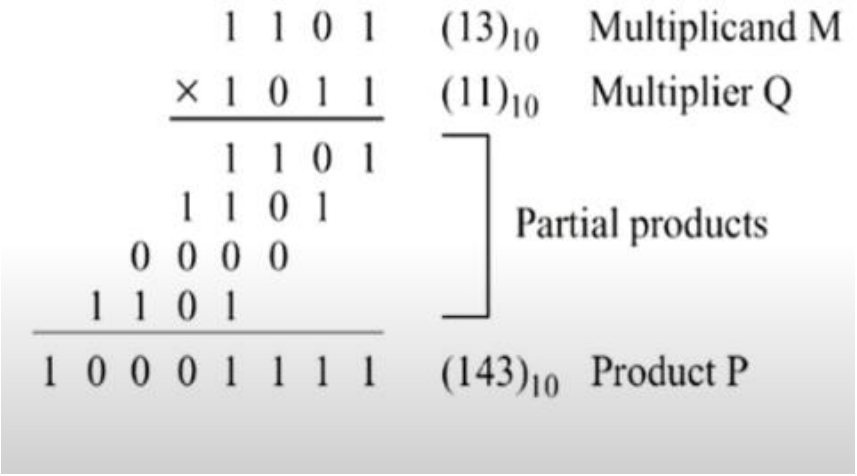
6) 7-SEGMENT DISPLAY

WORKING

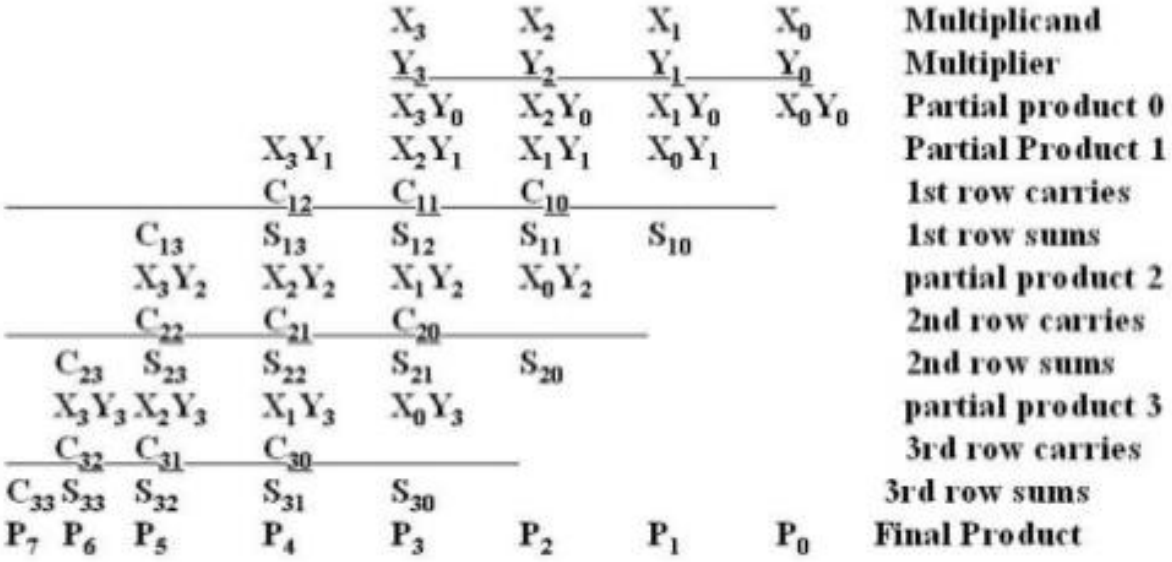
4-BIT ARRAY MULTIPLIER

Multiplication of binary numbers is performed in the same way as multiplication of decimal numbers.
The multiplicand is multiplied by each bit of the multiplier, starting from the least significant bit. Each such multiplication forms a partial product.
Successive partial products are shifted one position to the left. The final product is obtained from the sum of the partial products.
4-Bit Array Multiplier circuit is made of 4 bits of Multiplicand input and 4-bits of Multiplier input and use of "And" gates and "Full Adders" to form Partial Products.

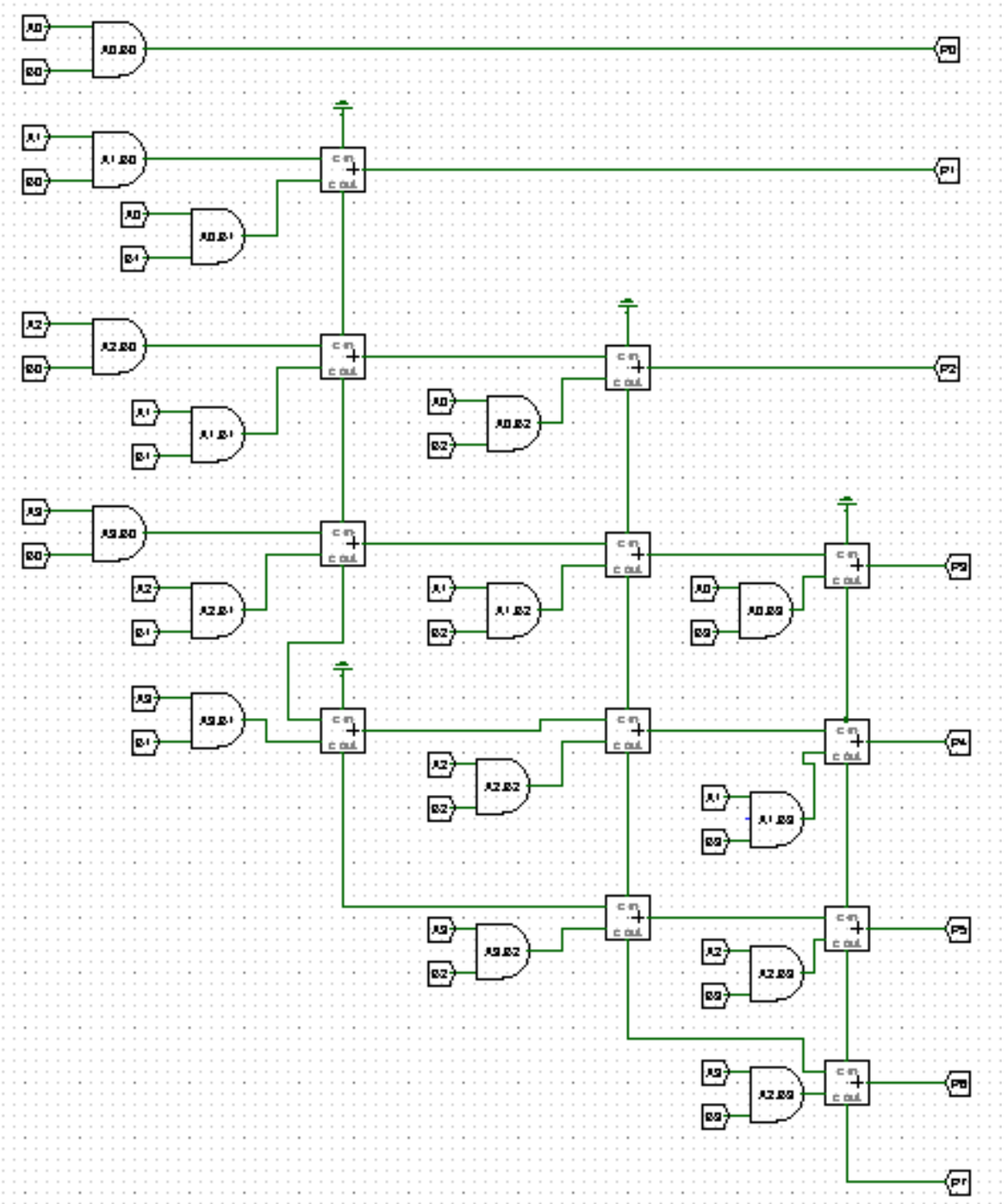
EXAMPLE:



MULTIPLICATION IN DETAIL:



CIRCUIT:



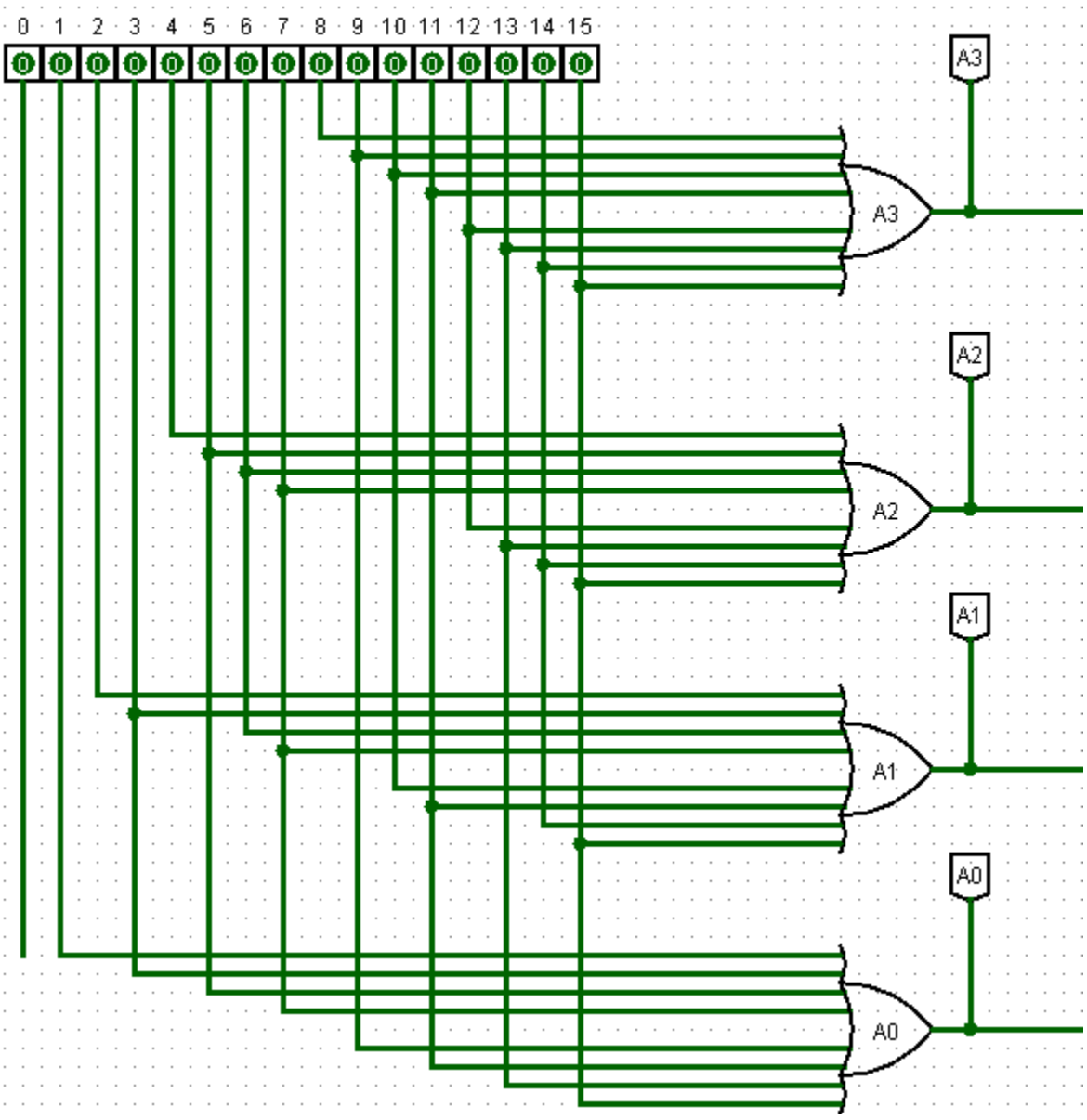
HEXADECIMAL TO BINARY ENCODER

We are using "Hexadecimal to Binary Encoder" so that user can give input of Multiplicand and Multiplier as Decimal values ie 0 to 15 in this case instead of Binary Values ie 0000 to 1111 .

EXAMPLE:

let user wants to enter 15 as input for Multiplicand then in Binary it would be "1111" but for making it simple for user we used "Hexadecimal to Binary Encoder " so using which user can just select 15 as input and the circuit will take it as input and convert that input to binary number ie 1111 to further work on the input.

circuit:



BINARY TO BCD CONVERTOR

We are also using "Binary to BCD convertor" because we want to use 7-SEGMENT DISPLAY to show the Multiplicand and Multiplier selected for Multiplication.

But since Binary input needed to be converted to BCD where BCD to 7-segment decoder does the remaining work inorder to use the 7-Segment Display .

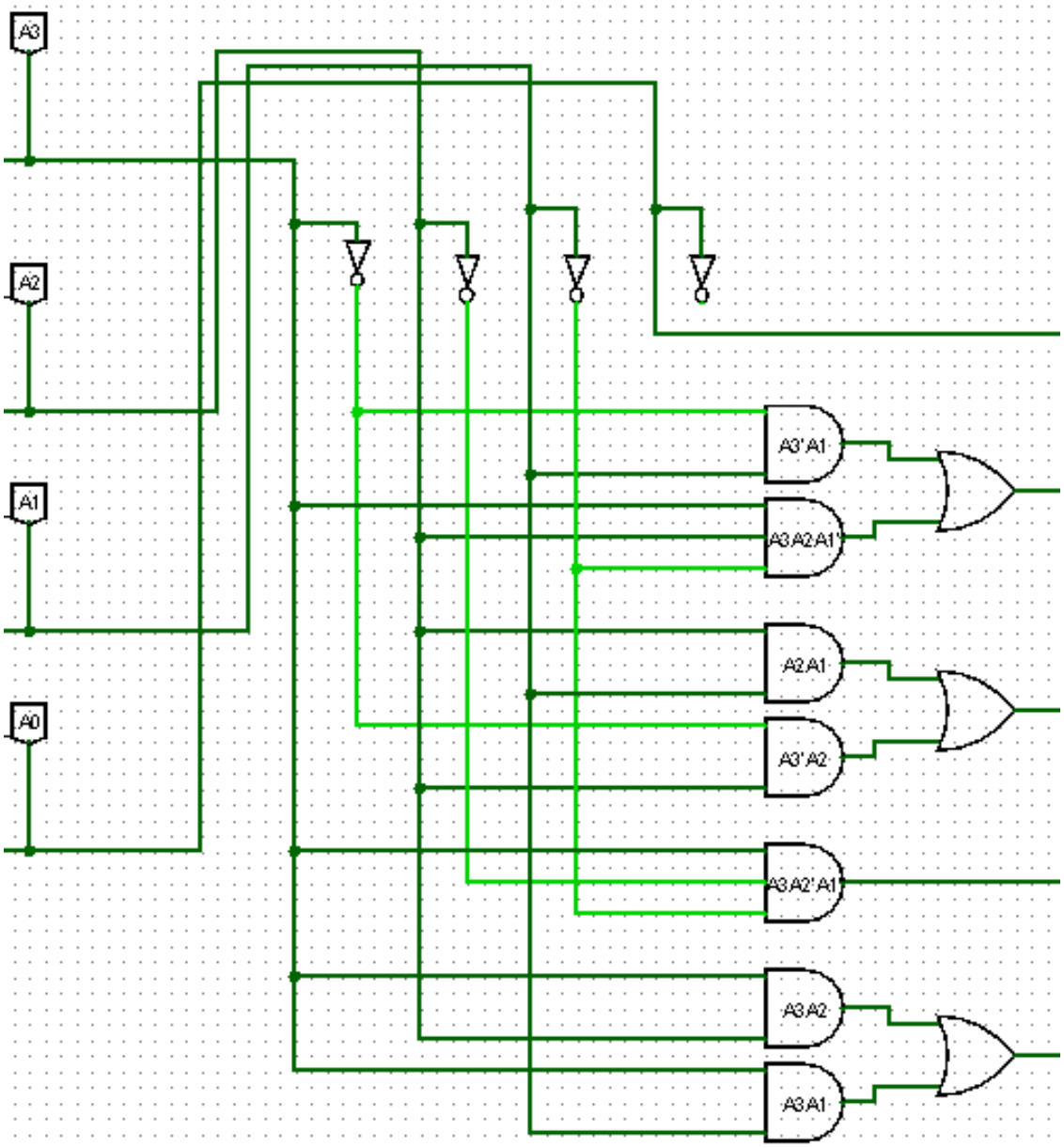
Binary to BCD convertor will take 4-bit binary number as input and produce 5-bit BCD code as covers the range 0000 to 1111 of binary input and produces BCD output of range 00000 to 11111.

EXAMPLE:

let binary input be "0011" ie 3 in decimal so BCD output will be "00011"

let binary input be "1110" ie 14 in decimal so BCD output will be "10100"

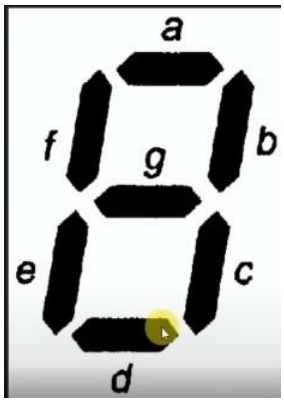
CIRCUIT:



BCD TO 7-SEGMENT DECODER

We are using BCD to 7-Segment decoder because we want to use "7-segment display" to display the Multiplicand and Multiplier value chosen by the user and thus to use 7-segment display we need to convert the BCD input to 7-segment output code to control each of the 7-segments of the display.

7-segments of display:

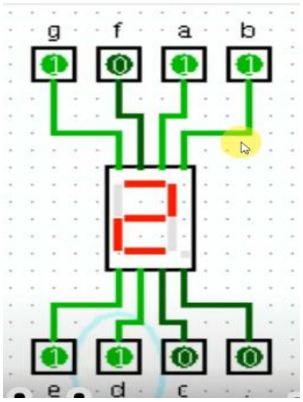


here we can see 7-Segments of the display named a,b,c,d,e,f,g.

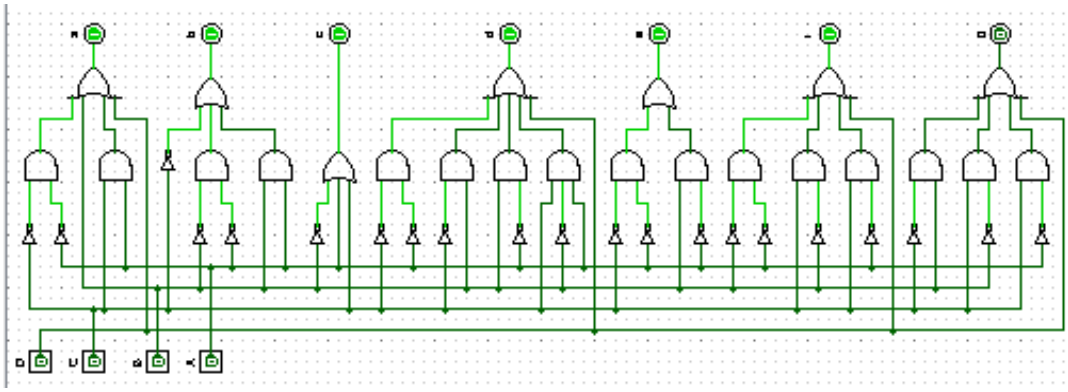
EXAMPLE:

As we can see this example that to display value "2" on 7-segment display we need segments a,b,d,e,g in "ON" state ie 1

output code.



CIRCUIT:

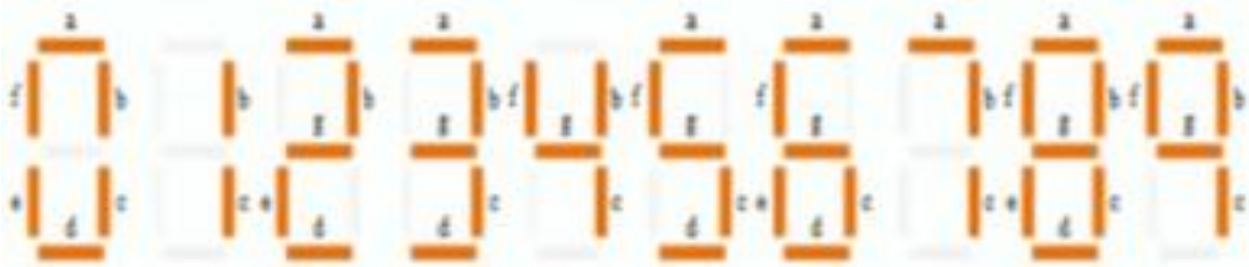


7-SEGMENT DISPLAY

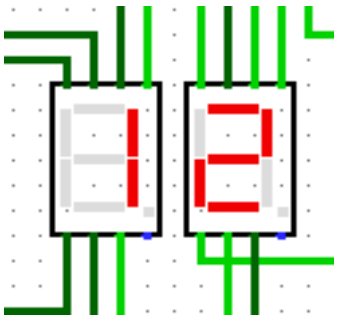
We used "7-Segment display" to display input Numbers of Multiplicand and Multiplier from decimal range 0 to 15 since our maximum input value can be 15 in decimal and so to display 15 we need to displays as left display will show "1" and right display will show "5" .

Since we know that left display will only show two numbers ie 0 and 1 thus its BCD to7-segment decoder input range will only have 0000 and 0001 .

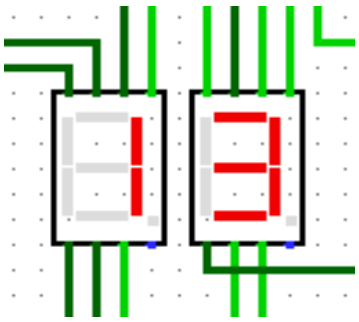
The right display however will show numbers from 0 to 9 so its BCD to 7-segment decoder input range will be from 0000 to 1001.



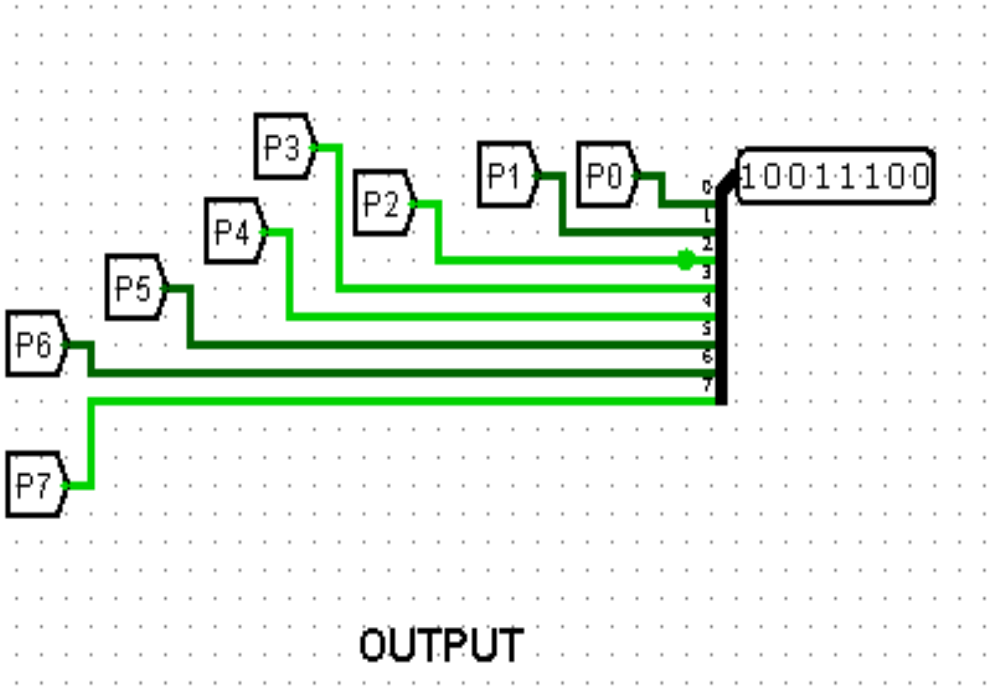
WORKING DEMO



MULTIPLICAND



MULTIPLIER



BIBILIOGRAPHY

1) https://en.wikipedia.org/wiki/Binary_multiplier

2) https://en.wikipedia.org/wiki/Seven-segment_display