

ECE111|Digital Circuits

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Lab\_6:

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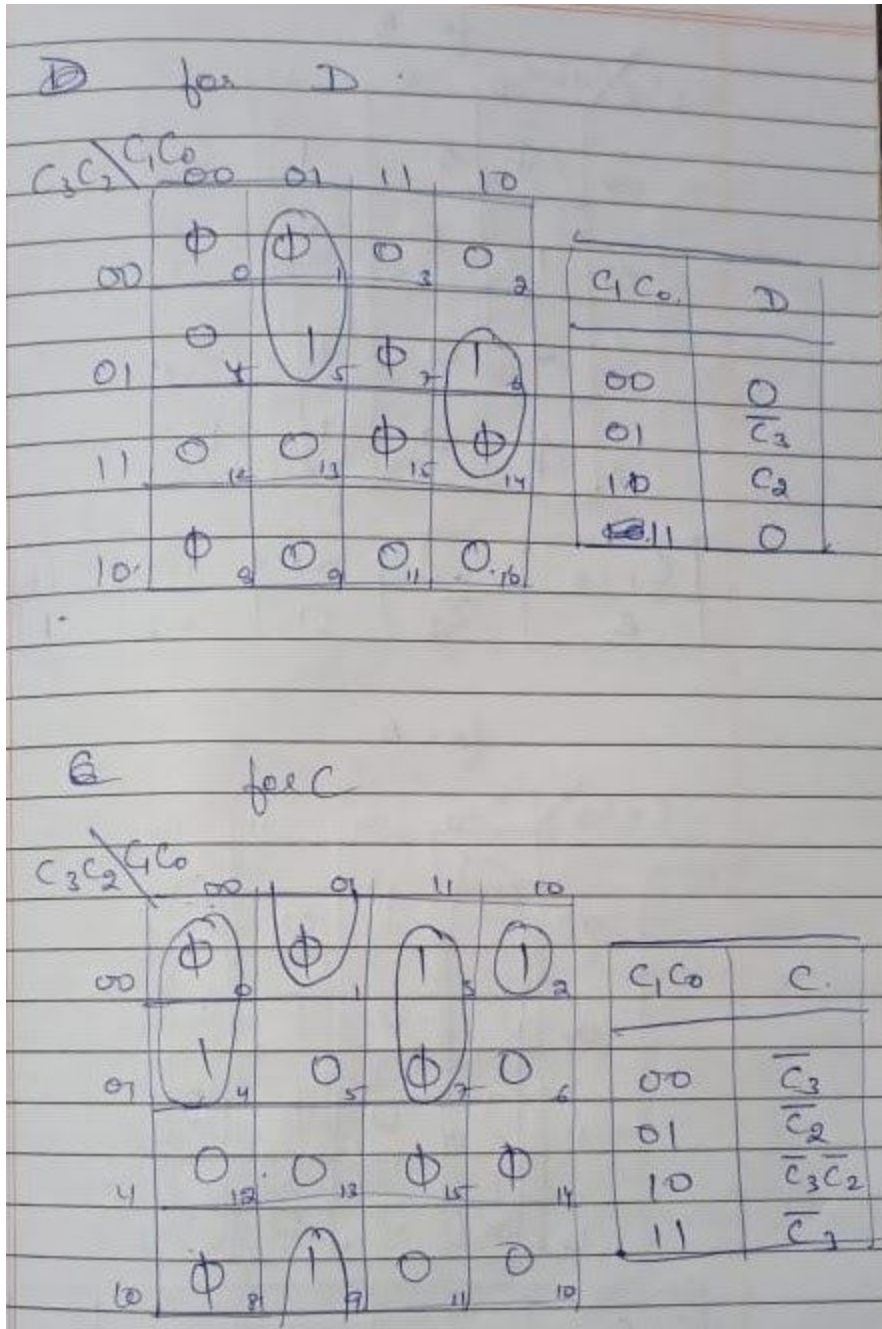
**AIM 1 : Decoder circuit for generating BCD code from encrypted code**

**Truth Table :**

<u>INPUT</u>				<u>N</u>	<u>OUTPUT</u>			
<u>C3</u>	<u>C2</u>	<u>C1</u>	<u>C0</u>		<u>D</u>	<u>C</u>	<u>B</u>	<u>A</u>
0	0	0	0	x	x	x	x	x
0	0	0	1	x	x	x	x	x
0	0	1	0	5	0	1	0	1
0	0	1	1	6	0	1	1	0
0	1	0	0	7	0	1	1	1
0	1	0	1	8	1	0	0	0
0	1	1	0	9	1	0	0	1
0	1	1	1	x	x	x	x	x
1	0	0	0	x	x	x	x	x
1	0	0	1	4	0	1	0	0
1	0	1	0	3	0	0	1	1
1	0	1	1	2	0	0	1	0
1	1	0	0	1	0	0	0	1

1	1	0	1	0	0	0	0	0
1	1	1	0	x	x	x	x	x
1	1	1	1	x	x	x	x	x

**K-Maps :**



for B

$C_3 \backslash C_2 \ C_1 \ C_0$	00	01	11	10
00	$\Phi$ <sub>0</sub>	$\Phi$ <sub>1</sub>	1 <sub>3</sub>	0 <sub>2</sub>
01	1 <sub>4</sub>	0 <sub>5</sub>	$\Phi$ <sub>7</sub>	0 <sub>6</sub>
11	0 <sub>12</sub>	0 <sub>13</sub>	$\Phi$ <sub>15</sub>	$\Phi$ <sub>14</sub>
10	$\Phi$ <sub>8</sub>	0 <sub>9</sub>	1 <sub>11</sub>	1 <sub>10</sub>

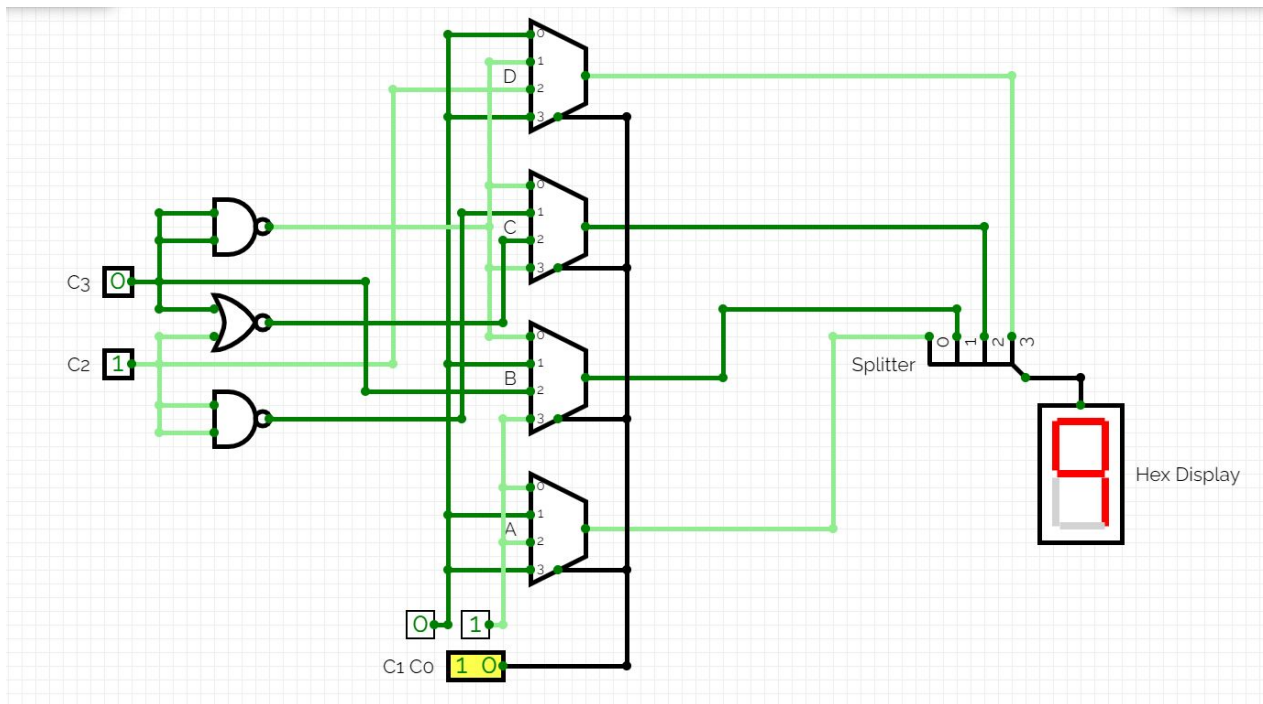
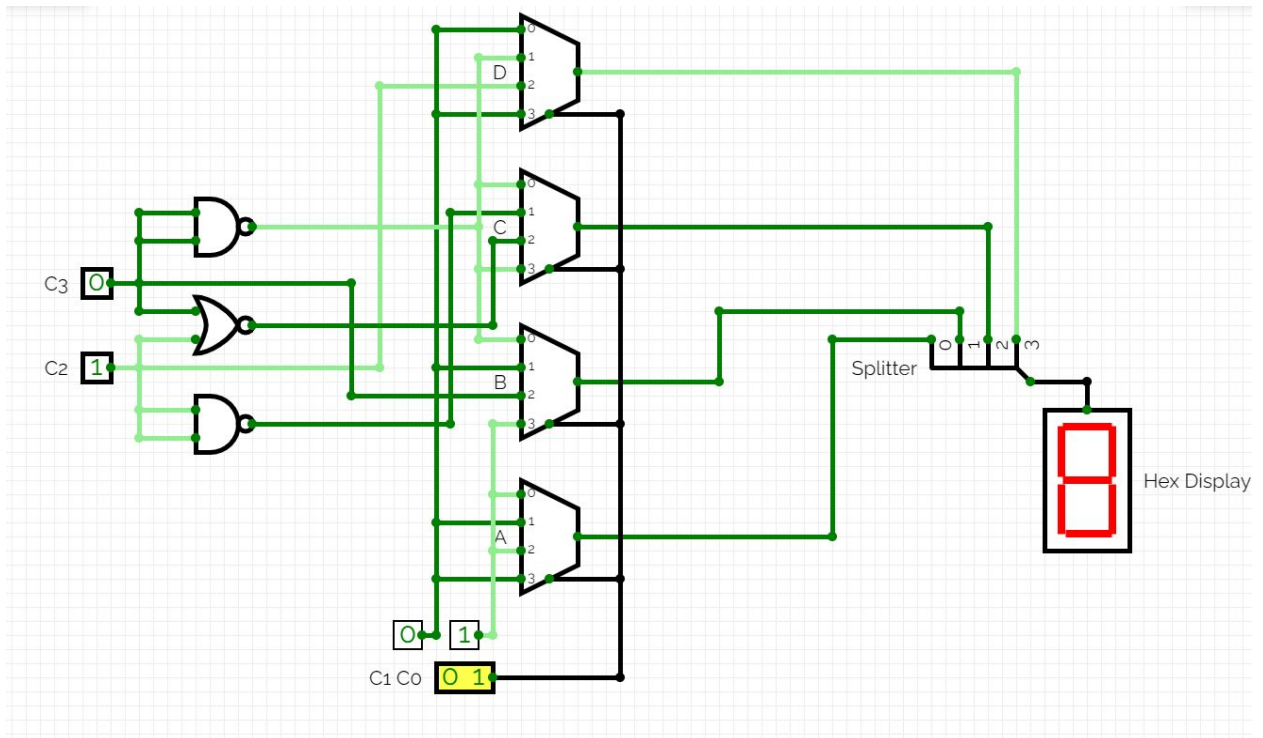
$C_1 \ C_0$	00	01	10	11
B	$\overline{C_3}$	0	$C_3$	1

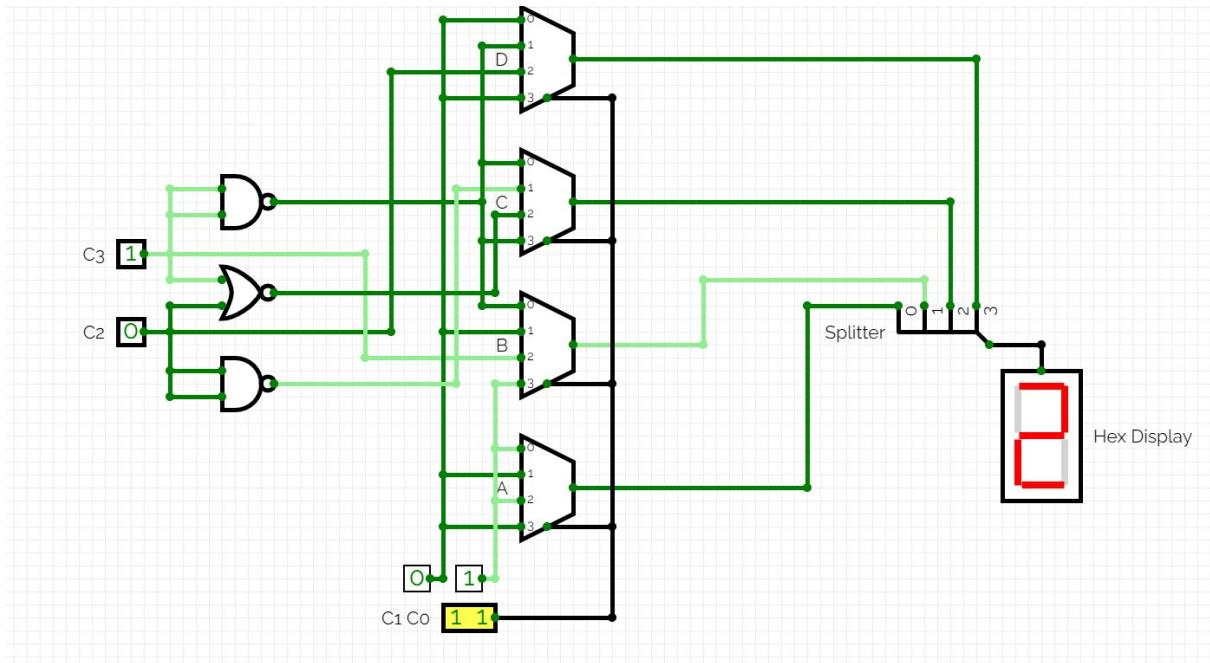
for A

$C_3 \backslash C_2 \ C_1 \ C_0$	00	01	11	10
00	$\Phi$ <sub>0</sub>	$\Phi$ <sub>1</sub>	0 <sub>3</sub>	1 <sub>2</sub>
01	1 <sub>4</sub>	0 <sub>5</sub>	$\Phi$ <sub>7</sub>	1 <sub>6</sub>
11	1 <sub>12</sub>	0 <sub>13</sub>	$\Phi$ <sub>15</sub>	$\Phi$ <sub>14</sub>
10	$\Phi$ <sub>8</sub>	0 <sub>9</sub>	0 <sub>11</sub>	1 <sub>10</sub>

$C_1 \ C_0$	00	01	10	11
A	1	0	1	0

## Screenshots :





### **Observations :**

The given circuit converts the encrypted code into a decrypted BCD code based on the logic :

For  $4 \geq N \geq 0$ ,  $C3C2C1C0 = 13 - N$  (in decimal), and

for  $9 \geq N \geq 5$ ,  $C3C2C1C0 = N - 3$  (in decimal).

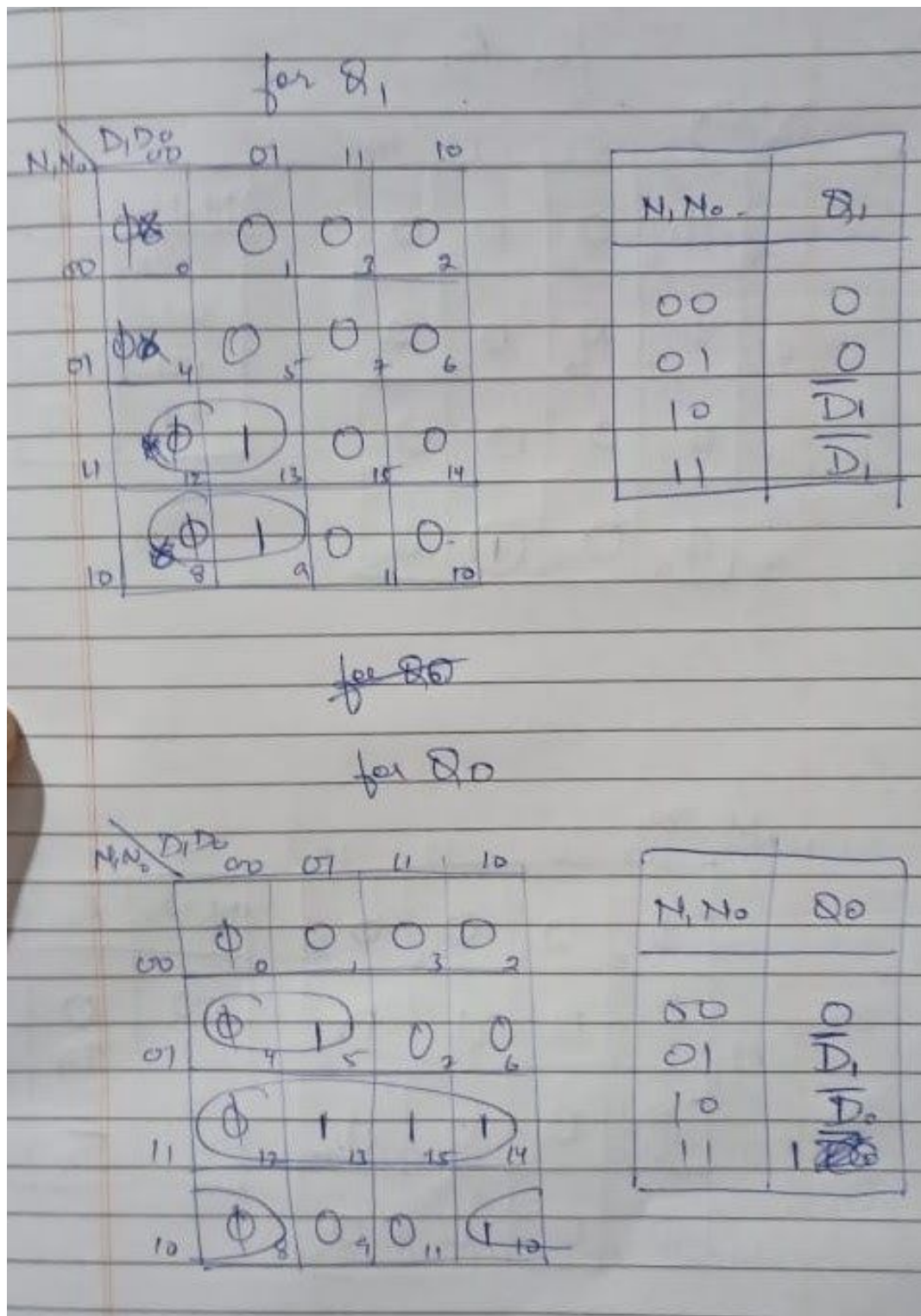
## AIM 2 : Divider Circuit for 2-bit Binary Numbers

Truth Table :

<u>INPUT</u>				<u>OUTPUT</u>			
<u>N1</u>	<u>N0</u>	<u>D1</u>	<u>D0</u>	<u>Q1</u>	<u>Q0</u>	<u>R1</u>	<u>R0</u>
0	0	0	0	x	x	x	x
0	0	0	1	0	0	0	0
0	0	1	0	0	0	0	0
0	0	1	1	0	0	0	0
0	1	0	0	x	x	x	x
0	1	0	1	0	1	0	0
0	1	1	0	0	0	0	1
0	1	1	1	0	0	0	1
1	0	0	0	x	x	x	x
1	0	0	1	1	0	0	0
1	0	1	0	0	1	0	0
1	0	1	1	0	0	1	0
1	1	0	0	x	x	x	x
1	1	0	1	1	1	0	0
1	1	1	0	0	1	0	1
1	1	1	1	0	1	0	0



## K-Maps :



for  $R_1$

$N_1, N_0$	00	01	11	10
00	$\phi_0$	$\phi_1$	$\phi_3$	$\phi_2$
01	$\phi_4$	$\phi_5$	$\phi_7$	$\phi_6$
11	$\phi_{12}$	$\phi_{13}$	$\phi_{15}$	$\phi_{14}$
10	$\phi_8$	$\phi_9$	$\phi_{11}$	$\phi_{10}$

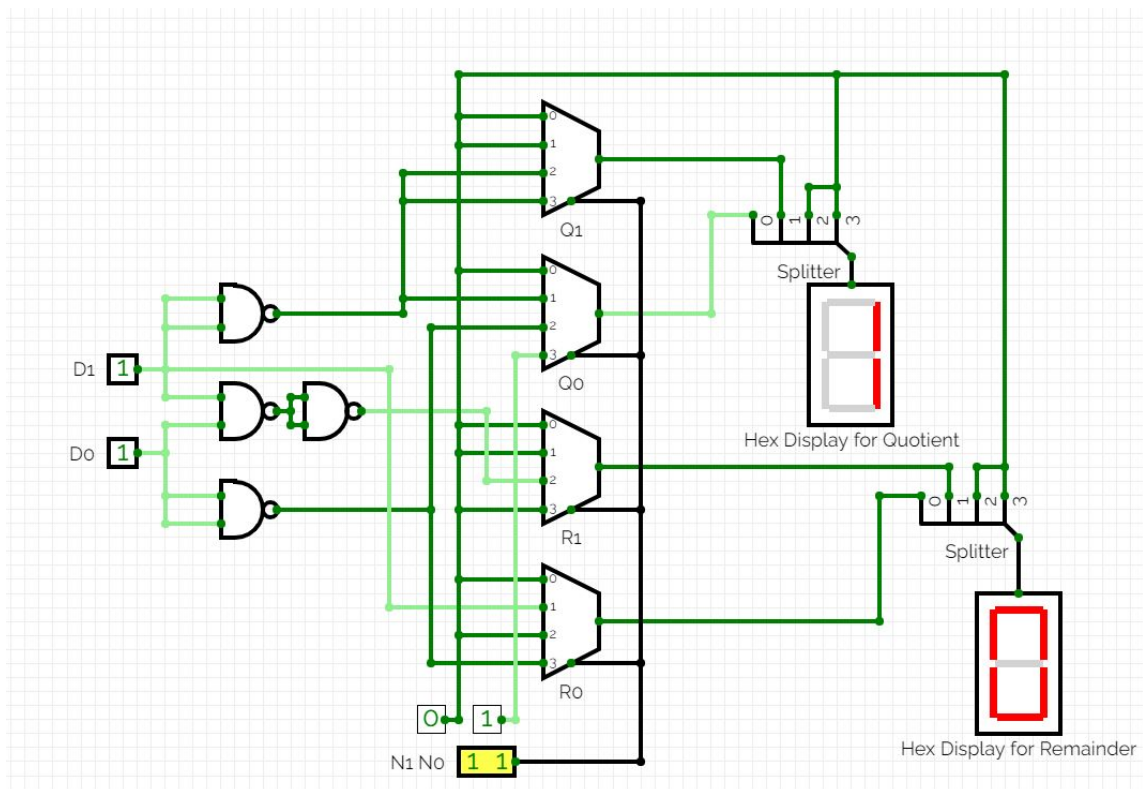
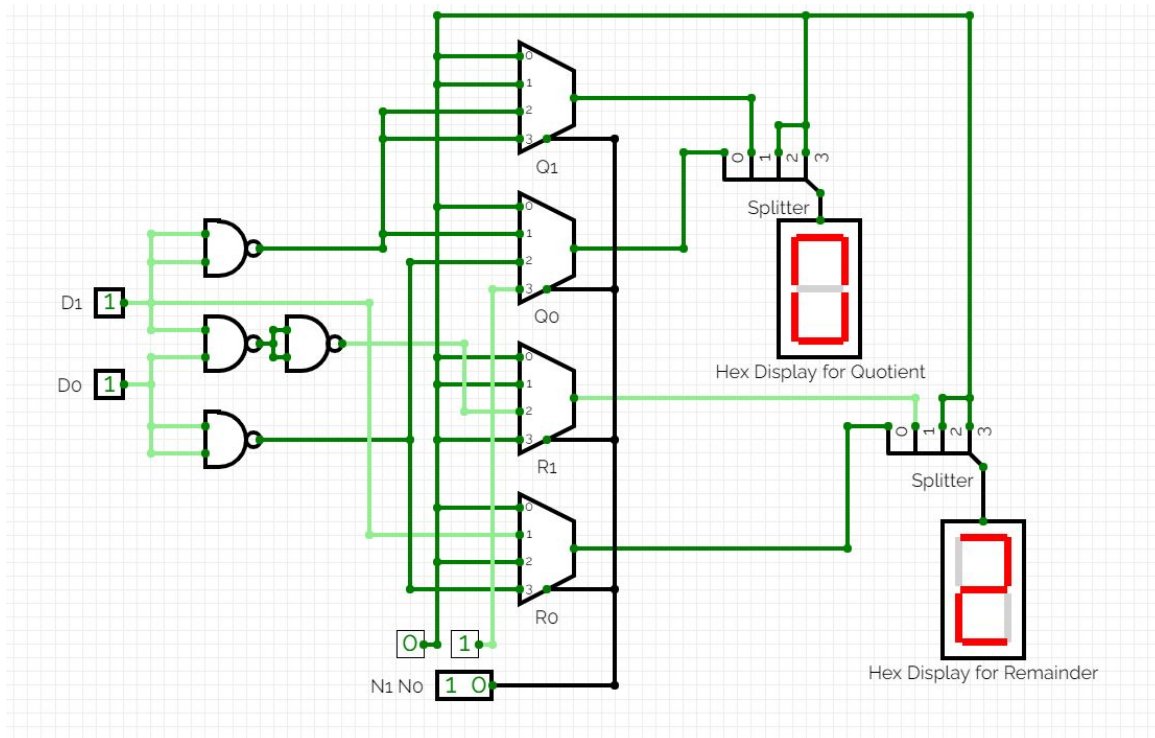
$N_1, N_0$	$R_1$
00	0
01	0
10	$\phi_0 \phi_1$
11	0

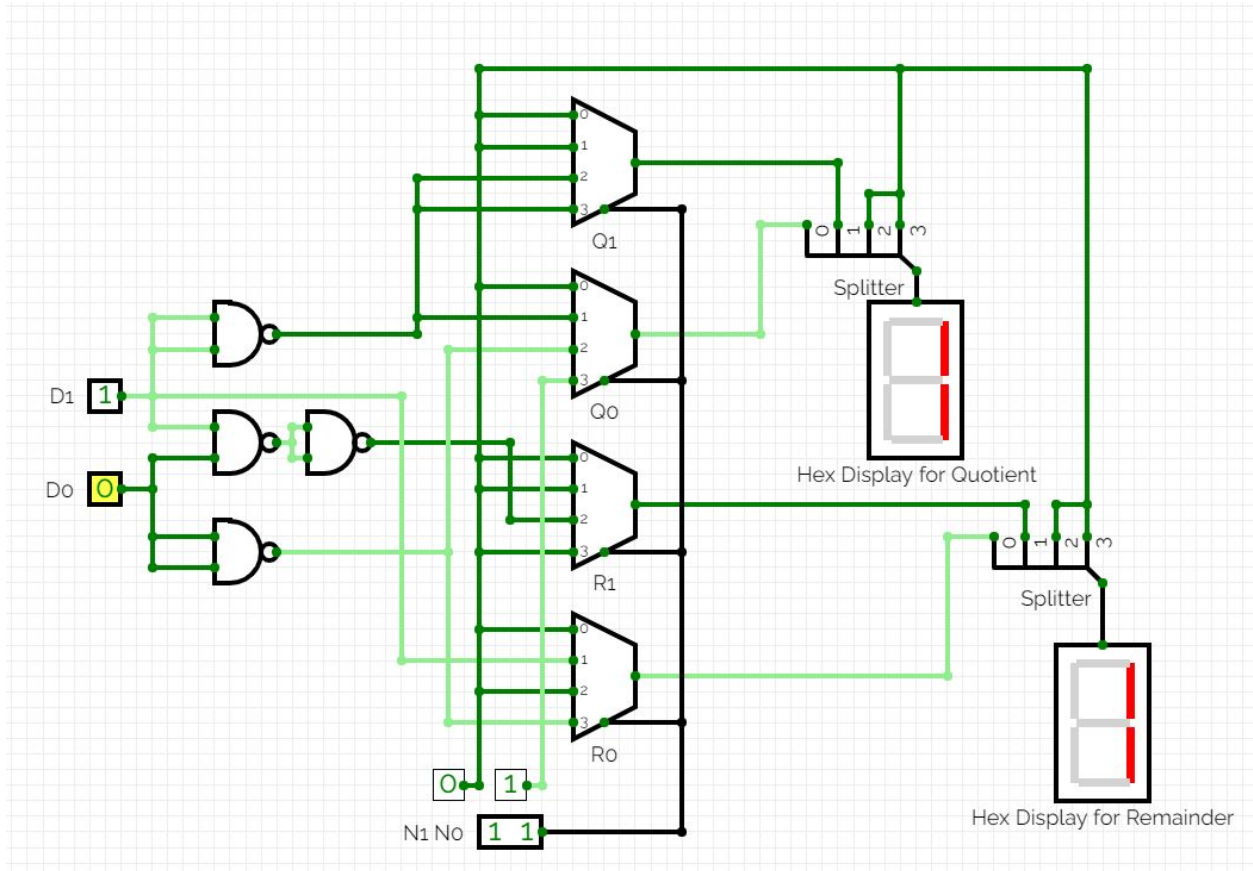
$N_1, N_0$	00	01	11	10
00	$\phi_0$	$\phi_1$	$\phi_3$	$\phi_2$
01	$\phi_4$	$\phi_5$	$\phi_7$	$\phi_6$
11	$\phi_{12}$	$\phi_{13}$	$\phi_{15}$	$\phi_{14}$
10	$\phi_8$	$\phi_9$	$\phi_{11}$	$\phi_{10}$

$N_1, N_0$	$R_0$
00	0
01	$\phi_1$
10	$\phi_0$
11	$\phi_2$



## Screenshots :





### **Observations :**

The above circuit returns the Quotient(Q1Q0) and the Remainder (R1R0) when a 2 bit number (N1N0) is divided by another 2 bit number (D1D0) using a pair of hex displays.