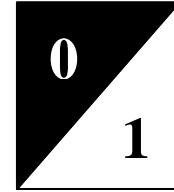




**ISTANBUL TECHNICAL  
UNIVERSITY**



**COMPUTER ENGINEERING**

**DIGITAL CIRCUITS LABORATORY  
EXPERIMENT REPORT**

**EXPERIMENT NO: 2**

**EXPERIMENT NAME: IMPLEMENTATION OF  
COMBINATIONAL CIRCUITS**

**EXPERIMENT DATE : 08.03.2013**

**GROUP NO: 6**

**STUDENTS WHO DID THE EXPERIMENT:**

<b>Student no</b>	<b>Name</b>	<b>Surname</b>
040100113	MUSTAFA	UÇAR
040100117	TUĞRUL	YATAĞAN
040100124	EMRE	GÖKREM

**ASSISTANT NAME WHO ASSISTED THE  
EXPERIMENT: FİGEN ÖZTÜRK**

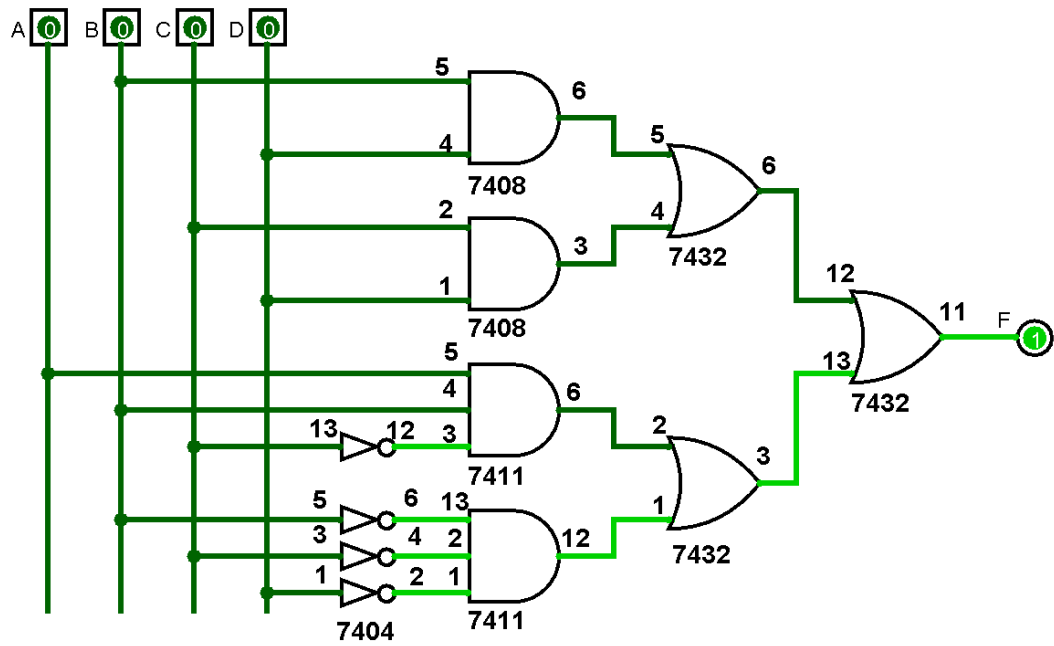
**Aim:** Finding the minimum cost of combinational circuits is the goal of this experiment

## Experiment #1

$$F(A,B,C,D) = (B.D + D.C) + (A.B.C' + B'.C'.D')$$

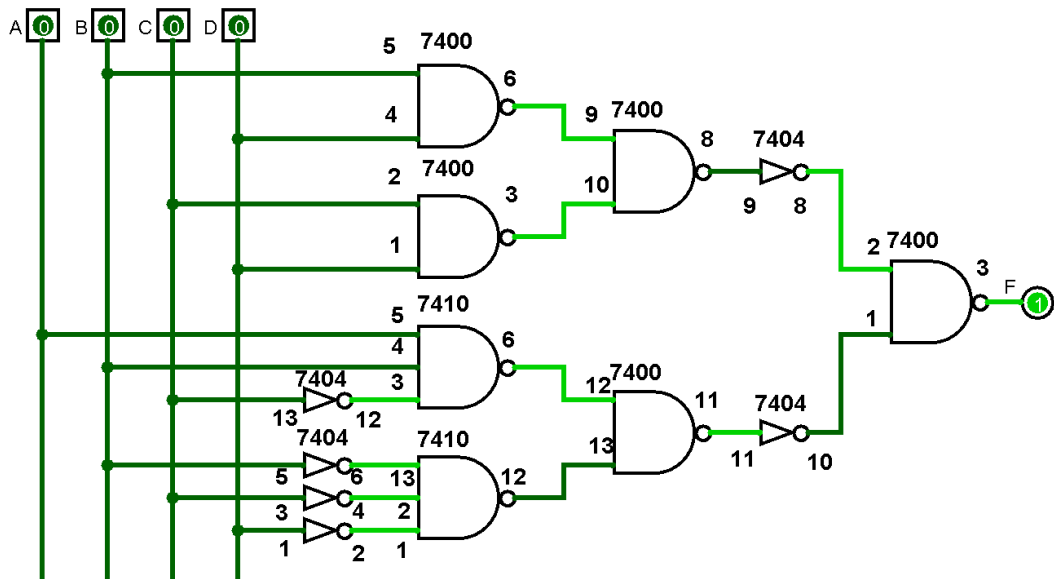
A B \ C D	00	01	11	10
00	1 <sub>0</sub>	* <sub>1</sub>	1 <sub>3</sub>	0 <sub>2</sub>
01	0 <sub>4</sub>	1 <sub>5</sub>	1 <sub>7</sub>	0 <sub>6</sub>
11	1 <sub>12</sub>	1 <sub>13</sub>	* <sub>15</sub>	0 <sub>14</sub>
10	* <sub>8</sub>	0 <sub>9</sub>	1 <sub>11</sub>	0 <sub>10</sub>

	A	B	C	D	F
0	0	0	0	0	1
1	0	0	0	1	$\phi$
2	0	0	1	0	0
3	0	0	1	1	1
4	0	1	0	0	0
5	0	1	0	1	1
6	0	1	1	0	0
7	0	1	1	1	1
8	1	0	0	0	$\phi$
9	1	0	0	1	0
10	1	0	1	0	0
11	1	0	1	1	1
12	1	1	0	0	1
13	1	1	0	1	1
14	1	1	1	0	0
15	1	1	1	1	$\phi$



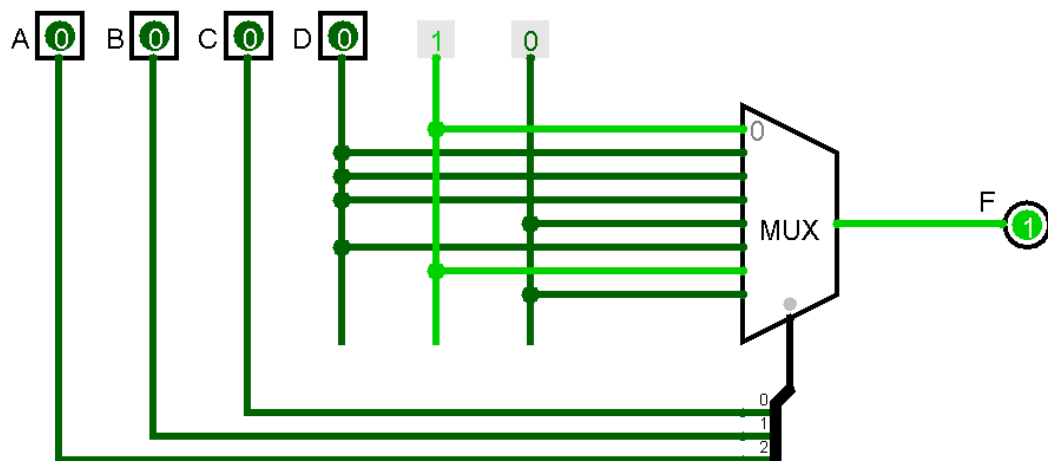
## Experiment #2

$$F(A,B,C,D) = [(B \downarrow D) \downarrow (C \downarrow D)]' \downarrow [(A \downarrow B \downarrow C') \downarrow (B' \downarrow C' \downarrow D')]'$$



## Experiment #3

	A	B	C	D	F	MUX
0	0	0	0	0	1	1
1	0	0	0	1	$\phi$	
2	0	0	1	0	0	D
3	0	0	1	1	1	
4	0	1	0	0	0	D
5	0	1	0	1	1	
6	0	1	1	0	0	D
7	0	1	1	1	1	
8	1	0	0	0	$\phi$	0
9	1	0	0	1	0	
10	1	0	1	0	0	D
11	1	0	1	1	1	
12	1	1	0	0	1	1
13	1	1	0	1	1	
14	1	1	1	0	0	0
15	1	1	1	1	$\phi$	

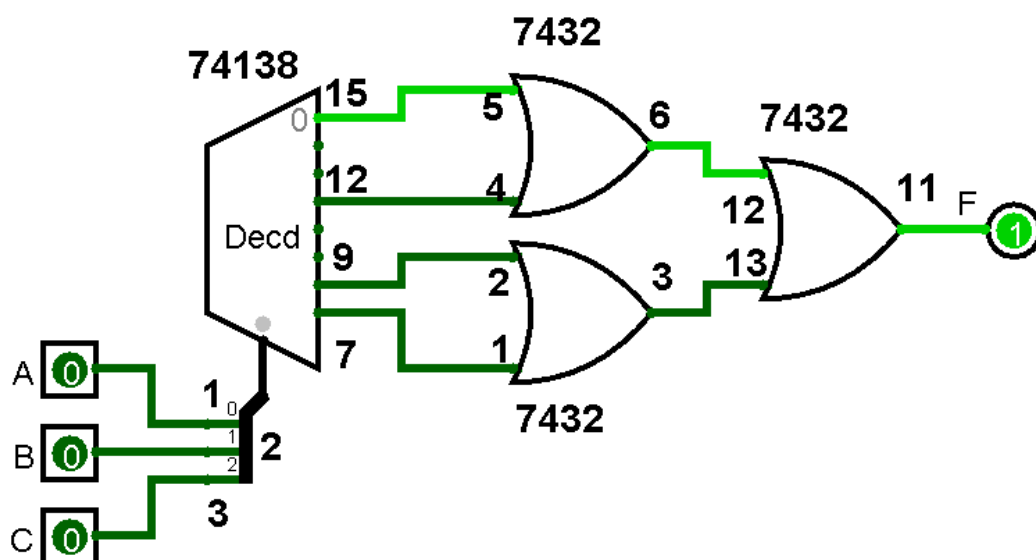


## Experiment #4

$$F_1(A,B,C) = A'.C' + B.C$$

$$F_1(A,B,C) = (A.B.C' + A'.B'.C') + (A.B.C + A'.B.C)$$

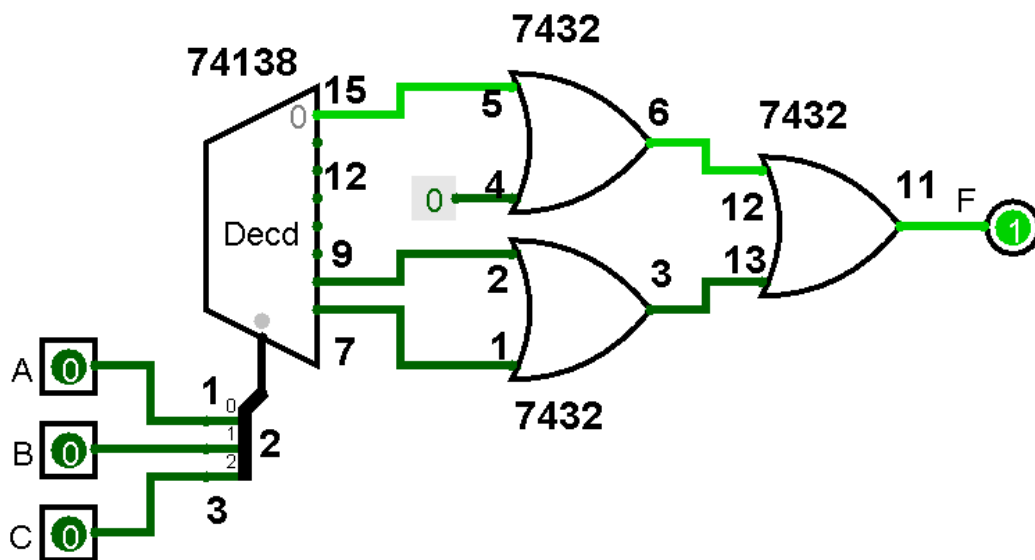
A	B	C	F
0	0	0	1
0	0	1	1
0	1	0	0
0	1	1	1
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1



$$F_2(A,B,C) = A' \cdot B' \cdot C' + A \cdot B$$

$$F_2(A,B,C) = (A \cdot B \cdot C + A' \cdot B' \cdot C') + (A \cdot B \cdot C' + 0)$$

A	B	C	F
0	0	0	1
0	0	1	0
0	1	0	0
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	1
1	1	1	1



### Answer of Question #3

$$F'(A,B,C,D) = A' \cdot B' \cdot C + A \cdot C' \cdot D' + B \cdot D'$$

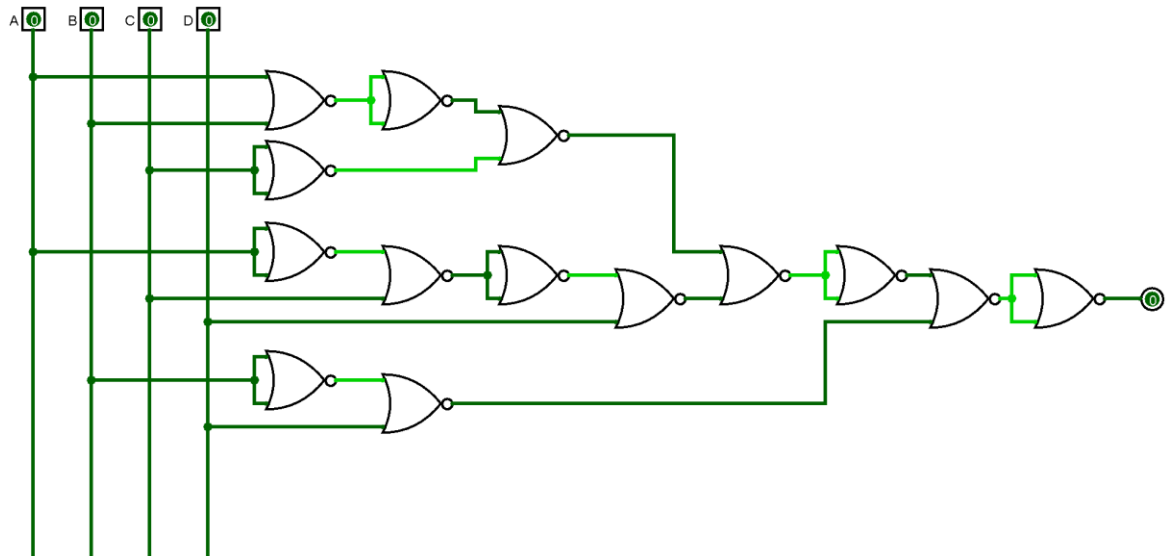
$$F'(A,B,C,D) = A' \cdot B' \cdot C \cdot (D + D') + A \cdot (B + B') \cdot C' \cdot D' + (A + A') \cdot B \cdot (C + C') \cdot D'$$

$$F'(A,B,C,D) = A' \cdot B' \cdot C \cdot D + A' \cdot B' \cdot C \cdot D' + A \cdot B \cdot C' \cdot D' + A \cdot B' \cdot C' \cdot D' + A \cdot B \cdot C \cdot D' + A \cdot B \cdot C' \cdot D' + A' \cdot B \cdot C \cdot D' + A' \cdot B \cdot C' \cdot D'$$

$$F'(A,B,C,D) = \sum m(4,6,8,10,11,12,14)$$

$$F'(A,B,C,D) = \prod M(0,1,2,3,5,7,9,13,15)$$

$$F'(A,B,C,D) = (A + B + C + D) \cdot (A + B + C + D') \cdot (A + B + C' + D) \cdot (A + B + C' + D') \cdot (A + B' + C + D') \cdot (A + B' + C' + D') \cdot (A' + B + C + D') \cdot (A' + B + C' + D') \cdot (A' + B' + C + D') \cdot (A' + B' + C' + D')$$



#### Answer of Question #4

