

| SELECTION |    |    |    | ACTIVE-HIGH DATA            |   |   |
|-----------|----|----|----|-----------------------------|---|---|
|           |    |    |    | M = H<br>LOGIC<br>FUNCTIONS | M = L; ARITHMETIC OPERATIONS              |   |
| S3        | S2 | S1 | S0 |                             | $\overline{C_n} = H$<br>(no carry)        | $\overline{C_n} = L$<br>(with carry)                      |
| L         | L  | L  | L  | $F = \overline{A}$          | $F = A$                                   | $F = A \text{ PLUS } 1$                                   |
| L         | L  | L  | H  | $F = \overline{A + B}$      | $F = A + B$                               | $F = (A + B) \text{ PLUS } 1$                             |
| L         | L  | H  | L  | $F = \overline{AB}$         | $F = A + \overline{B}$                    | $F = (A + \overline{B}) \text{ PLUS } 1$                  |
| L         | L  | H  | H  | $F = 0$                     | $F = \text{MINUS } 1 \text{ (2's COMPL)}$ | $F = \text{ZERO}$   |
| L         | H  | L  | L  | $F = \overline{AB}$         | $F = A \text{ PLUS } \overline{AB}$       | $F = A \text{ PLUS } \overline{AB} \text{ PLUS } 1$       |
| L         | H  | L  | H  | $F = \overline{B}$          | $F = (A + B) \text{ PLUS } \overline{AB}$ | $F = (A + B) \text{ PLUS } \overline{AB} \text{ PLUS } 1$ |
| L         | H  | H  | L  | $F = A \oplus B$            | $F = A \text{ MINUS } B \text{ MINUS } 1$ | $F = A \text{ MINUS } B$                                  |
| L         | H  | H  | H  | $F = \overline{AB}$         | $F = \overline{AB} \text{ MINUS } 1$      | $F = \overline{AB}$                                       |
| H         | L  | L  | L  | $F = \overline{A + B}$      | $F = A \text{ PLUS } AB$                  | $F = A \text{ PLUS } AB \text{ PLUS } 1$                  |
| H         | L  | L  | H  | $F = \overline{A \oplus B}$ | $F = A \text{ PLUS } B$                   | $F = A \text{ PLUS } B \text{ PLUS } 1$                   |
| H         | L  | H  | L  | $F = B$                     | $F = (A + \overline{B}) \text{ PLUS } AB$ | $F = (A + \overline{B}) \text{ PLUS } AB \text{ PLUS } 1$ |
| H         | L  | H  | H  | $F = AB$                    | $F = AB \text{ MINUS } 1$                 | $F = AB$  |
| H         | H  | L  | L  | $F = 1$                     | $F = A \text{ PLUS } A$                   | $F = A \text{ PLUS } A \text{ PLUS } 1$                   |
| H         | H  | L  | H  | $F = A + \overline{B}$      | $F = (A + B) \text{ PLUS } A$             | $F = (A + B) \text{ PLUS } A \text{ PLUS } 1$             |
| H         | H  | H  | L  | $F = A + B$                 | $F = (A + \overline{B}) \text{ PLUS } A$  | $F = (A + \overline{B}) \text{ PLUS } A \text{ PLUS } 1$  |
| H         | H  | H  | H  | $F = A$                     | $F = A \text{ MINUS } 1$                  | $F = A$   |

نمودار 1

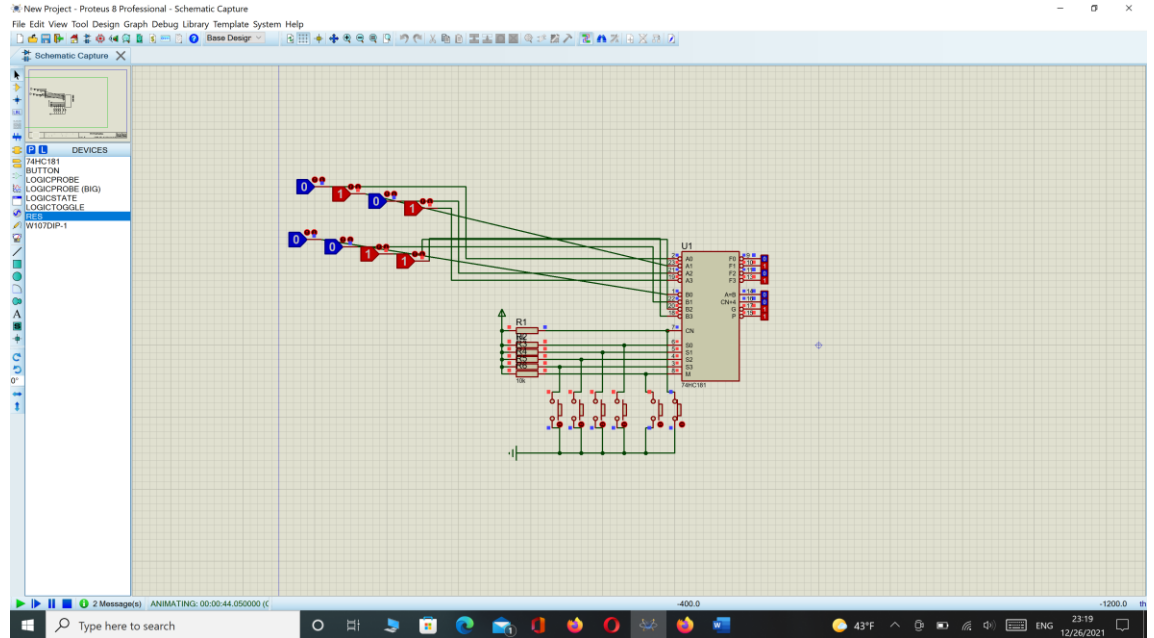
(منبع: [https://www.google.com/url?sa=i&url=http%3A%2F%2Fwww.righto.com%2F2017%2F03%2Finside-vintage-74181-alu-chip-how-it.html&psig=AOvVaw0nhp\\_UpaamTAp-pSjDYt6s&ust=1640633085707000&source=images&cd=vfe&ved=2ahUKEwiNy8HTmIL1AhWLx7sIHWUdAOEQjRx6BAgAEA](https://www.google.com/url?sa=i&url=http%3A%2F%2Fwww.righto.com%2F2017%2F03%2Finside-vintage-74181-alu-chip-how-it.html&psig=AOvVaw0nhp_UpaamTAp-pSjDYt6s&ust=1640633085707000&source=images&cd=vfe&ved=2ahUKEwiNy8HTmIL1AhWLx7sIHWUdAOEQjRx6BAgAEA))

با توجه به حالت های نمودار مدار را بستم و شروع به امتحان حالت ها کردم

دو حالت اصلی داریم که با M تغییر می کند اگر M = high ای سی منطقی عمل میکند و اگر M = Low ای سی arithmetic عمل میکند پس:

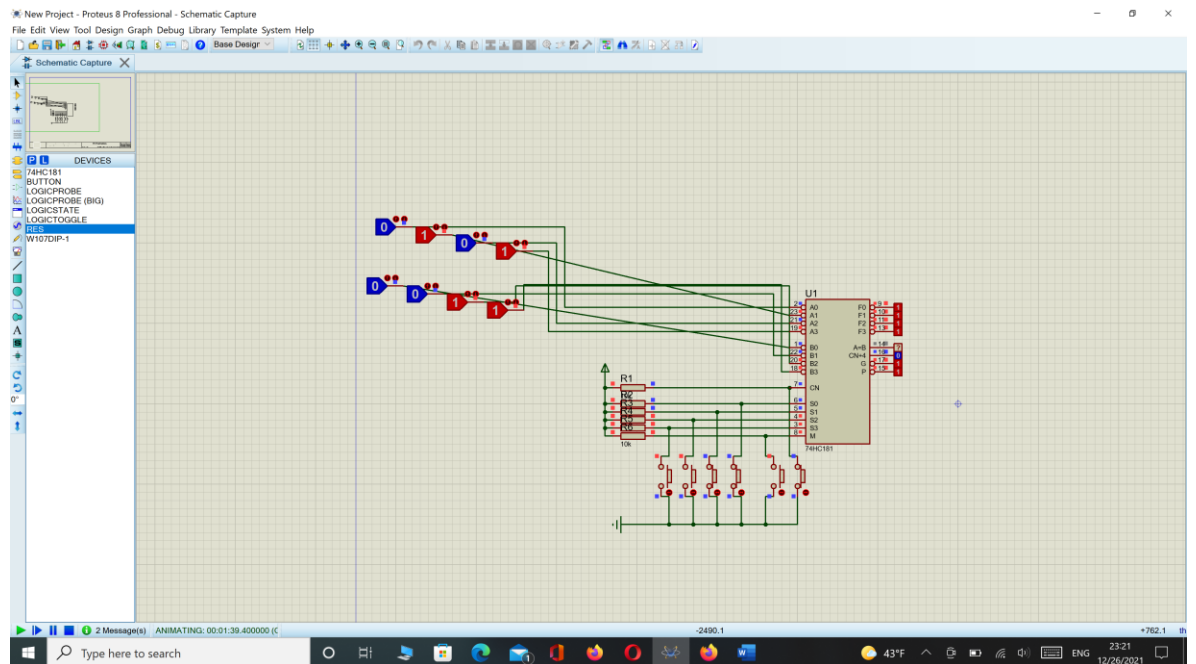
- Logic functions (M= high):
  - $F = A$ :  
 $S0=S1=S2=S3= \text{HIGH}$ :

شكل 1



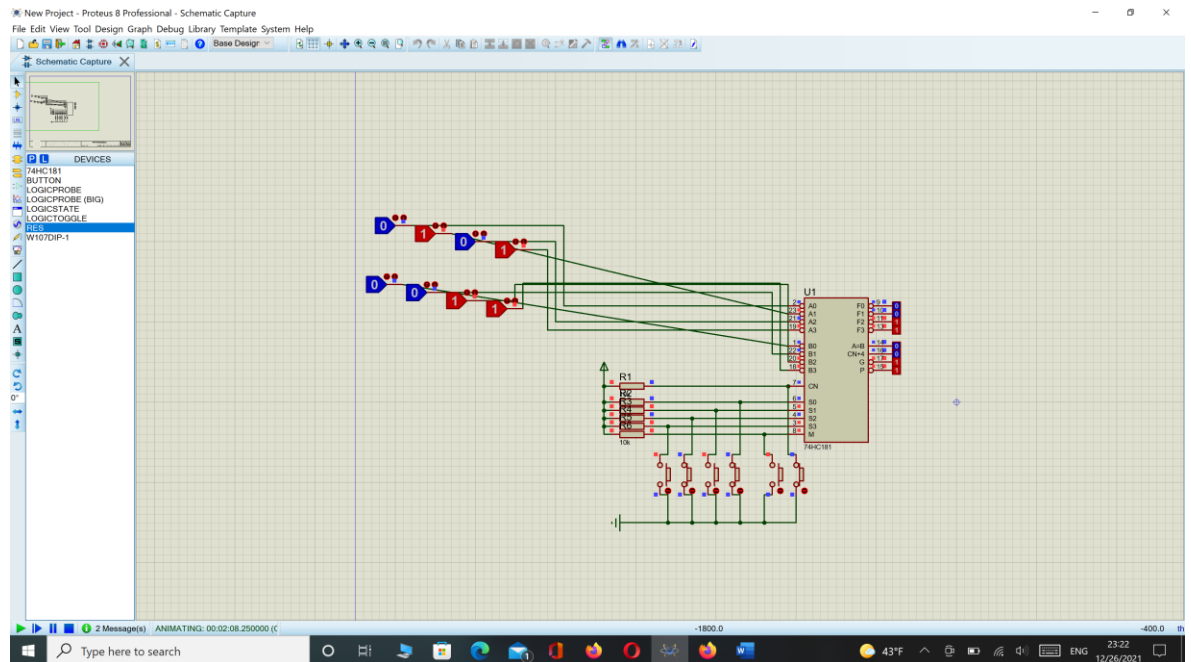
- $F = 1$ :  
 $S3=S2=\text{HIGH}$ ,  $S1=S0=\text{LOW}$

شكل 2



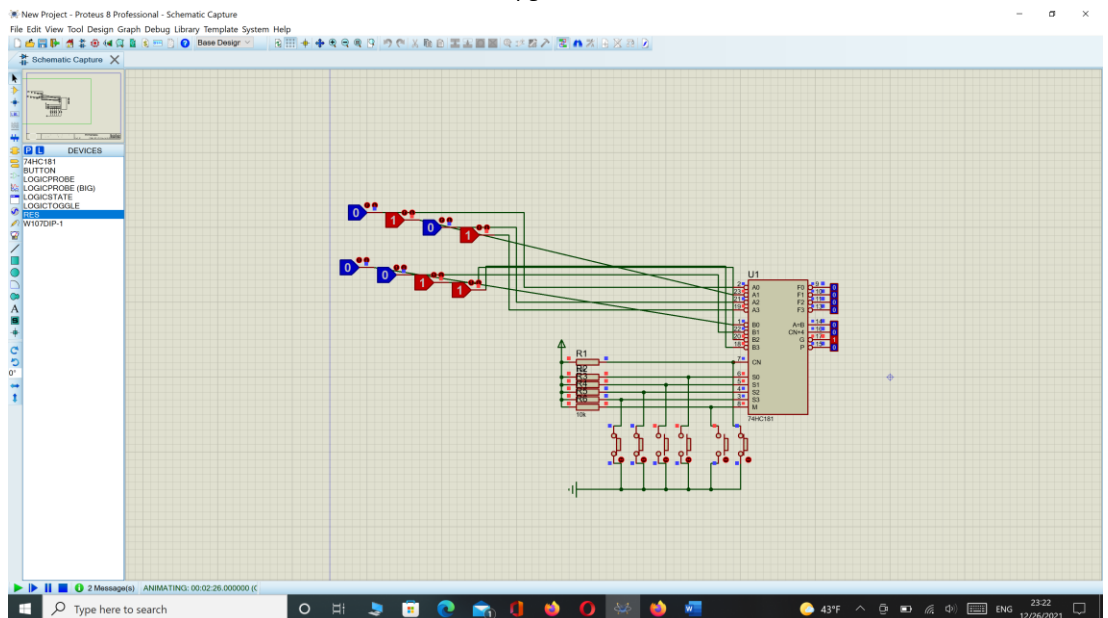
3.  $F = B$ :  
 $S3=S1=HIGH$  ,  $S2=S0=LOW$

شكل 3



4.  $F = 0$ :  
 $S3=S2=LOW$  ,  $S1=S0=HIGH$

شكل 4

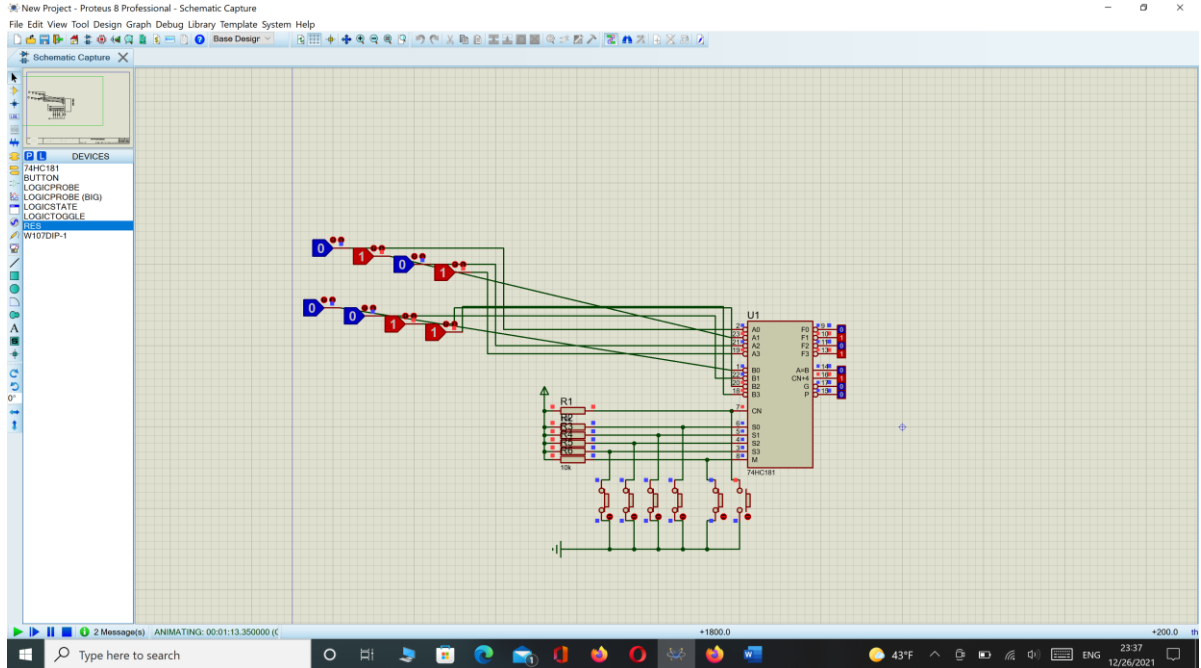


شکل 5



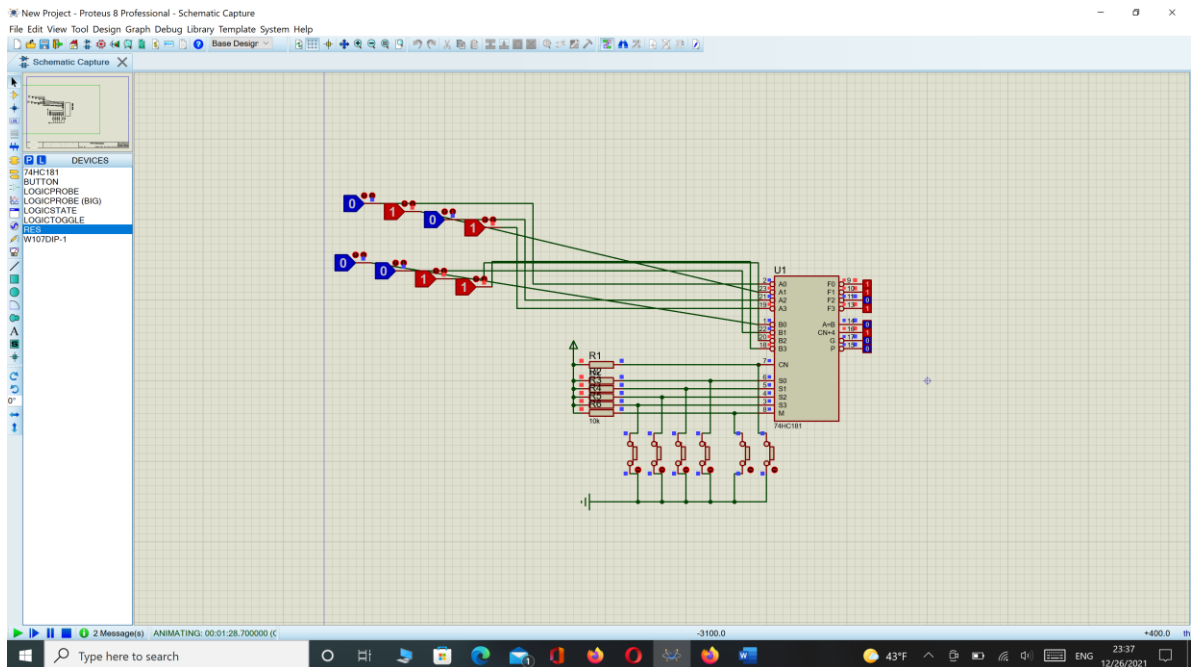
- Arithmetic functions (M= low):
  - $S_0, S_1, S_2, S_3 = L, CN = HIGH$   
 $\Rightarrow F = A$

شكل 6



- $S_0, S_1, S_2, S_3 = L, CN = LOW$   
 $\Rightarrow F = A \text{ PLUS } 1$   
 $1010 + 1 = 1011 \text{ (DONE)}$

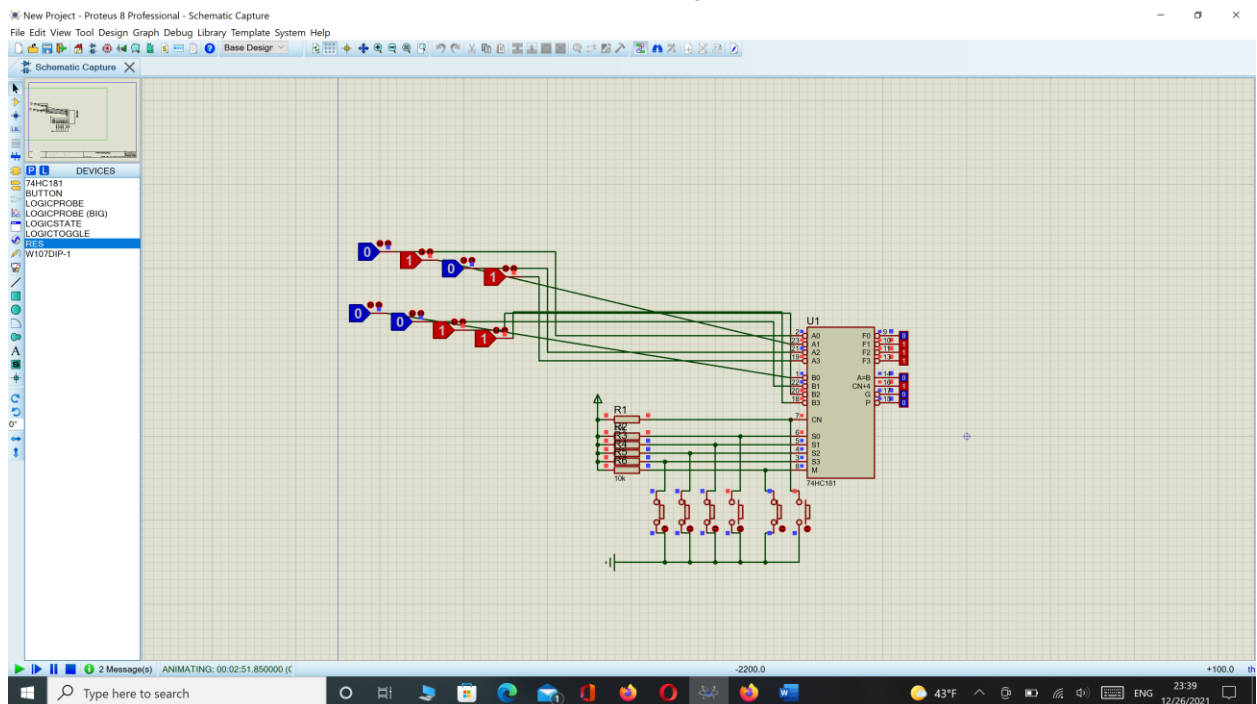
شكل 7



3.  $S_0=H$  ,  $S_1,S_2,S_3=L$  ,  $CN=HIGH$

$$\Rightarrow F=A+B$$

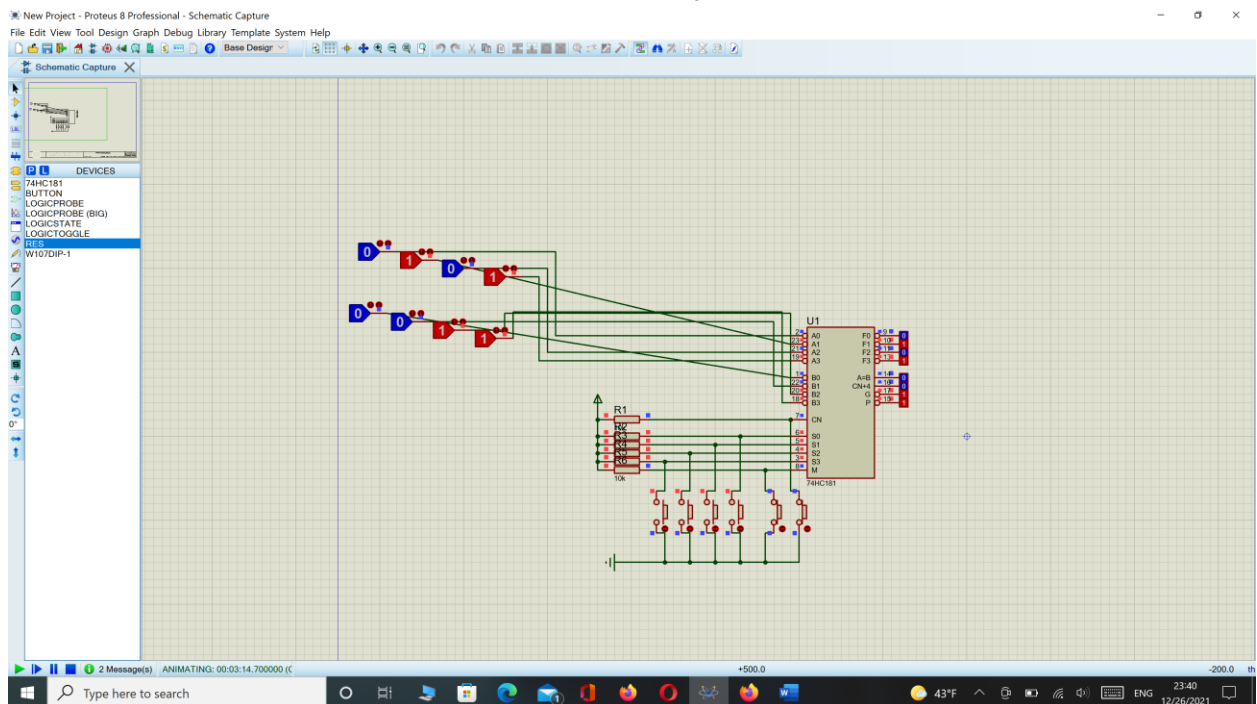
شكل 8



4.  $S_0,S_1,S_2,S_3=H$  ,  $CN=LOW$

$$\Rightarrow F=A$$

شكل 9



5. S1,S2 =L , S0,S3=H , CN=HIGH

⇒ F=A PLUS B

1010+1100=(1)0110 + CARRY=1 (DONE)

شكل 10

