

# Lab-6 Report

SOP Implementation with 4:1 Multiplexer

MIRIYALA PRANAY KAMAL  
200030033

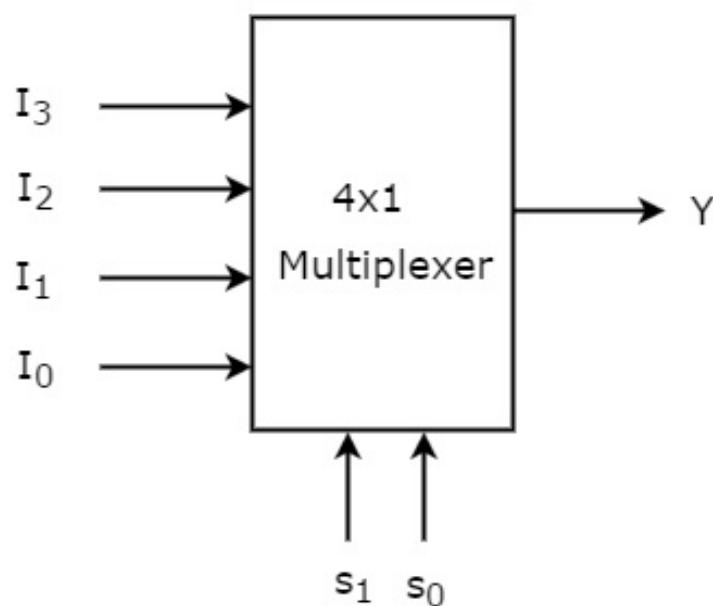
**Aim:** Implement following SOP with 4:1 MUX. Treat A, B as select lines ( $S_1, S_0$ ).

$$Y = f(A, B, C, D) = \Sigma m(3, 5, 7, 10, 12, 15) + d(9, 11, 13, 14)$$

## **Components used:**

1. Digital MUX DM74153
2. Digital AND gate 7408
3. Power supply
4. Breadboard
5. 1k resistor arrays (X2)
6. LED display
7. DIP switches

## **Diagram of 4:1 MUX:**



## Design Procedure & Circuit diagram:

SOP with 4:1 MUX

$(A, B) \rightarrow$  select lines

$$Y = f(A, B, C, D) = \sum m(3, 5, 7, 10, 12, 15) + d(9, 11, 13, 14)$$

	00	01	10	11
$\bar{C}\bar{D}$	$m_0$	$m_4$	$m_8$	$m_{12}$
$\bar{C}D$	$m_1$	$m_5$	$m_9$	$m_{13}$
$C\bar{D}$	$m_2$	$m_6$	$m_{10}$	$m_{14}$
$CD$	$m_3$	$m_7$	$m_{11}$	$m_{15}$

$$\begin{aligned}
 & \begin{array}{l} CD \\ \downarrow \\ I_0 \end{array} = D \\
 & \begin{array}{l} \bar{C}D + CD \\ \downarrow \\ I_1 \end{array} = \bar{C} + C = 1 \\
 & \begin{array}{l} \bar{C}\bar{D} + C\bar{D} + \bar{C}D + CD \\ \downarrow \\ I_2 \end{array} = (\bar{C} + C)(\bar{D} + D) = 1 \\
 & \begin{array}{l} \bar{C}\bar{D} + \bar{C}D + C\bar{D} + CD \\ \downarrow \\ I_3 \end{array} = 1
 \end{aligned}$$

$$I_0 = CD$$

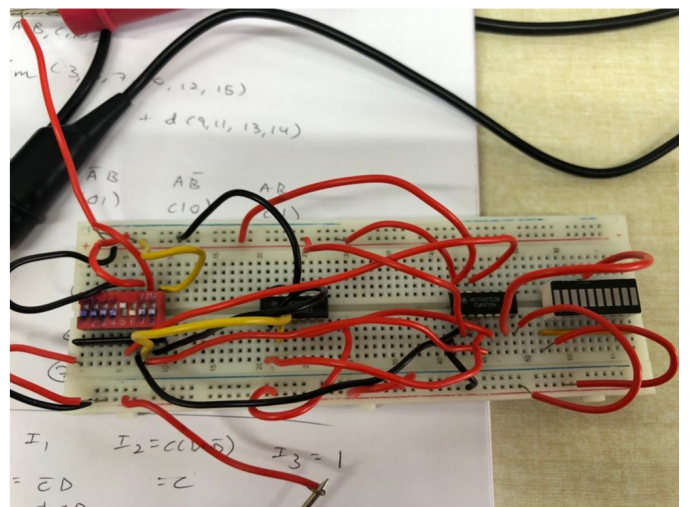
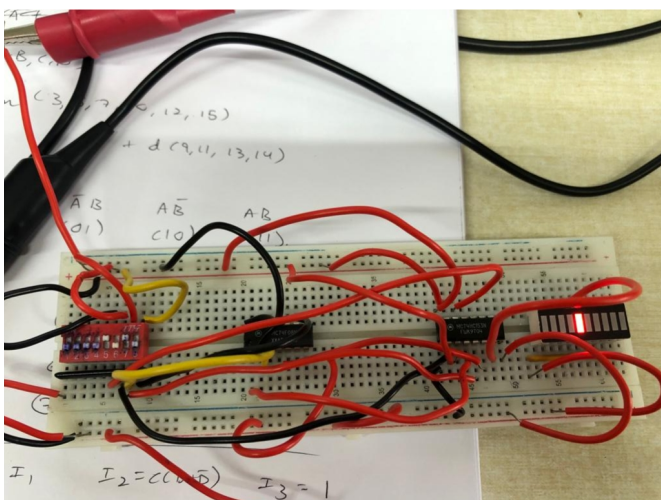
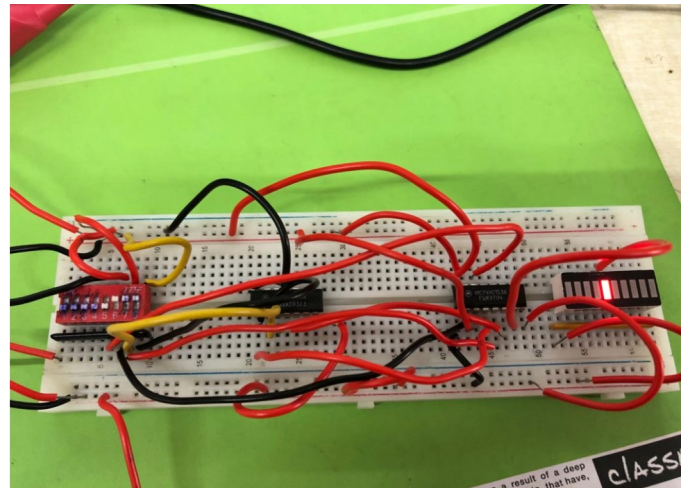
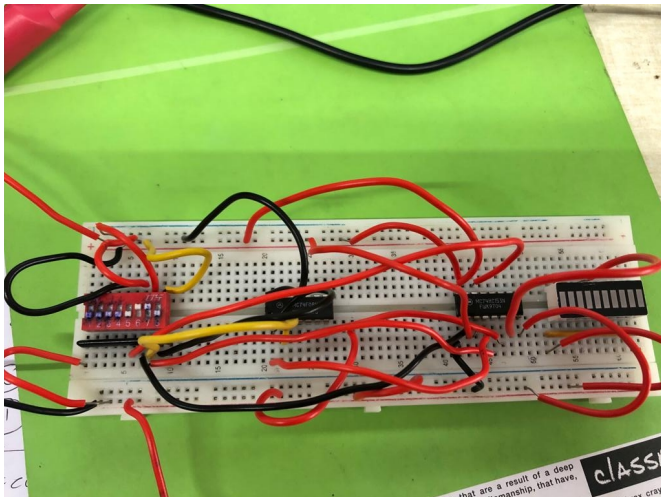
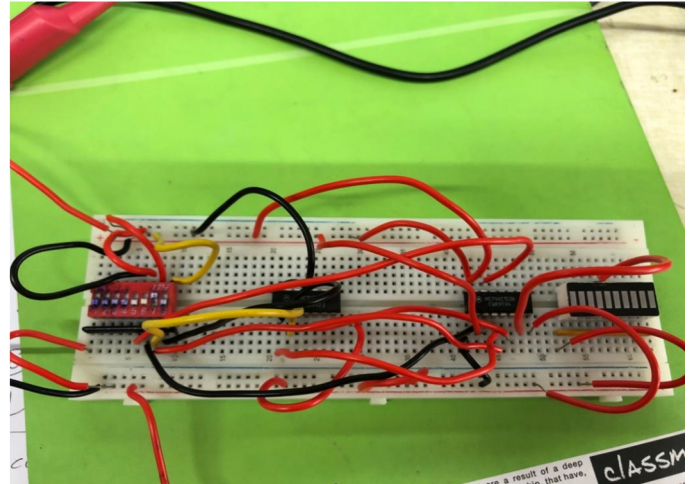
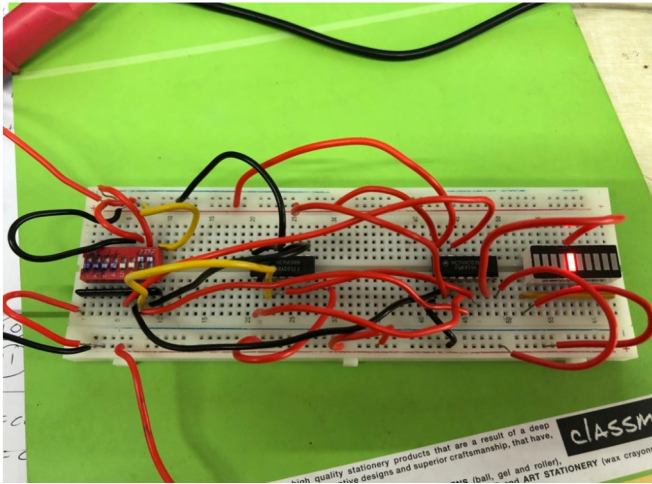
$$I_1 = 1$$

$$I_2 = \bar{C} + C = 1$$

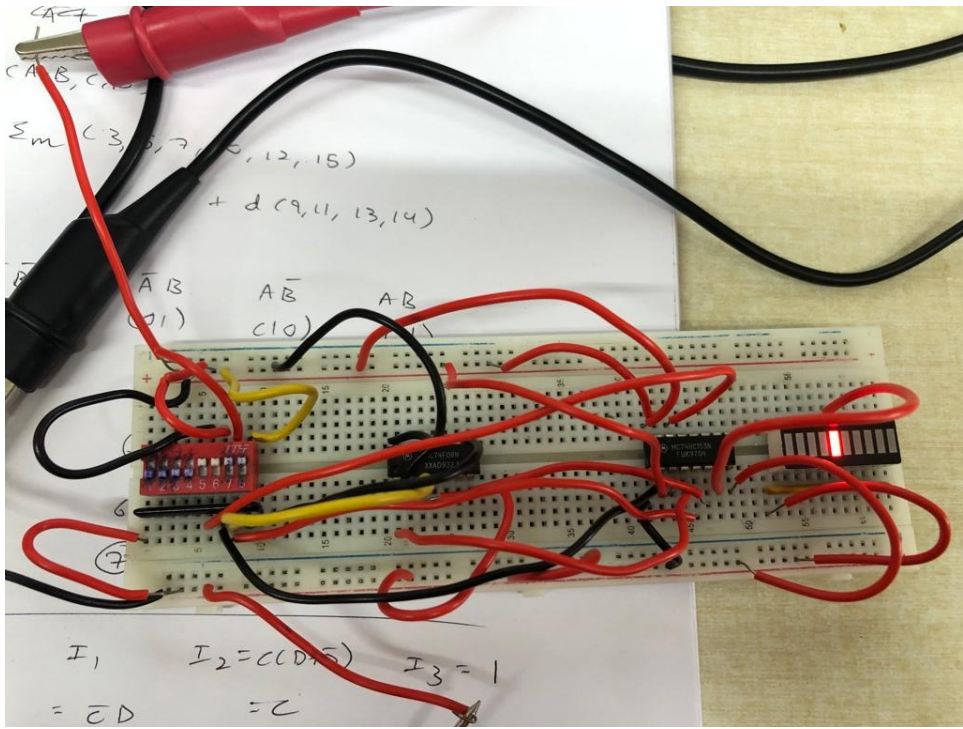
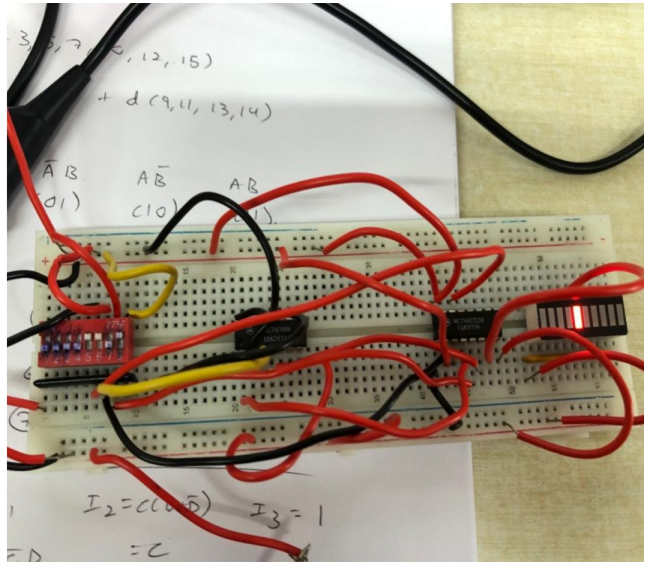
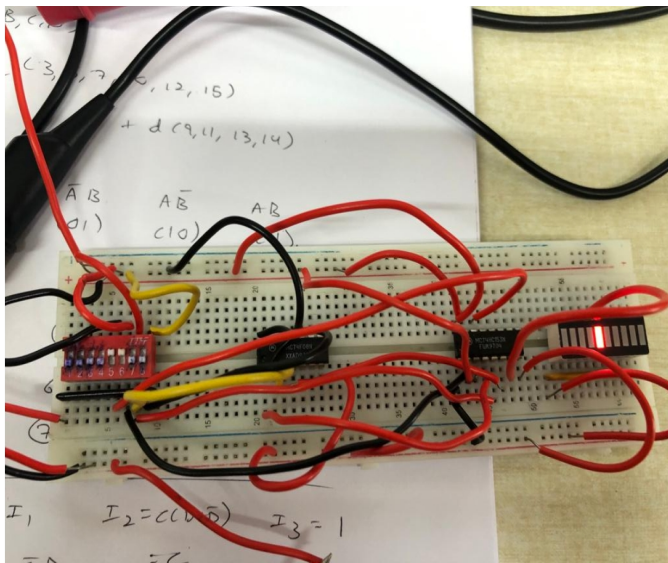
$$I_3 = 1$$

implemented

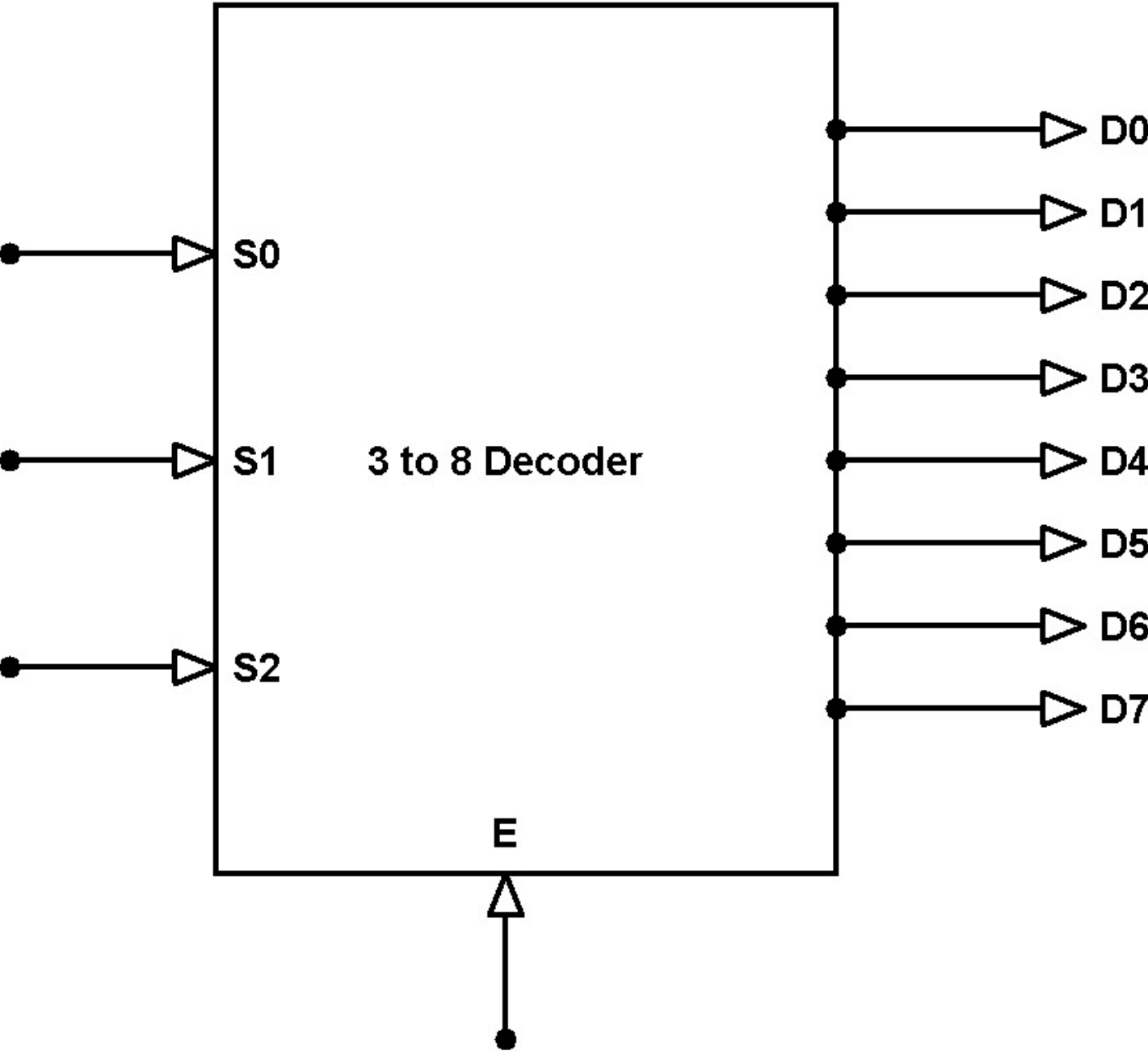
## Snapshots of MUX implementation:



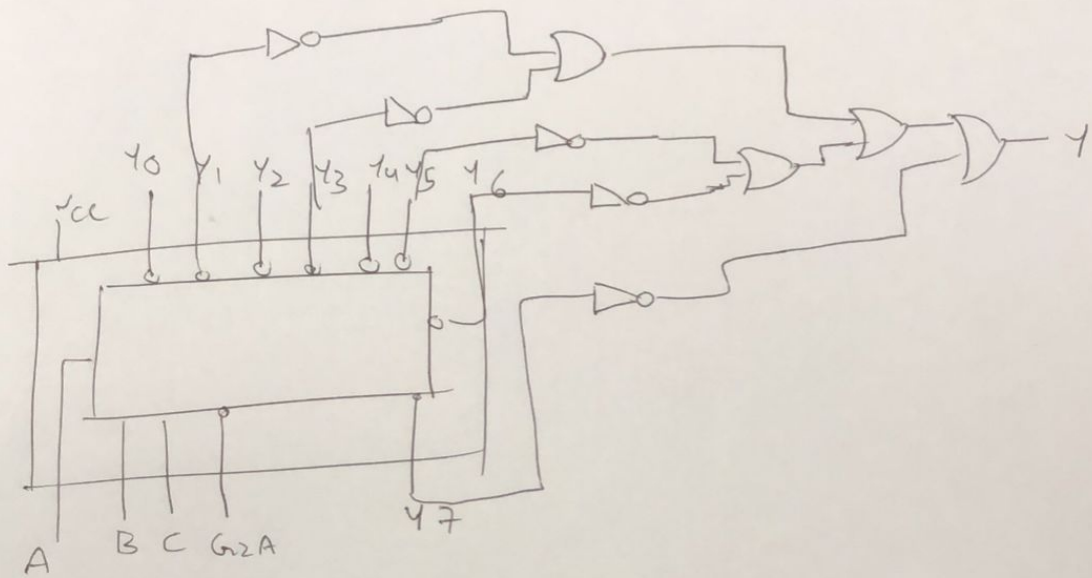




Decoder:



**Design Procedure & Circuit diagram:**



## **Results and Discussions:**

The snapshots corresponding to each of the MUX states exactly represents the required logic represented by the minimized logic expressions. Hence we have implemented the following SOP with 4:1 MUX. Treat A, B as select lines ( $S_1, S_0$ ).

## **Conclusions:**

I've learnt that Digital IC MUX DM74153 and 3:8 Decoder can be used to implement SOP minimized boolean expression, obtained. The inputs for selector lines to Multiplexers are given via switches and the outputs are observed through LEDs. I explored the technicalities involved with multiplexers and decoders, and also learnt how to operate as per the SOP function.