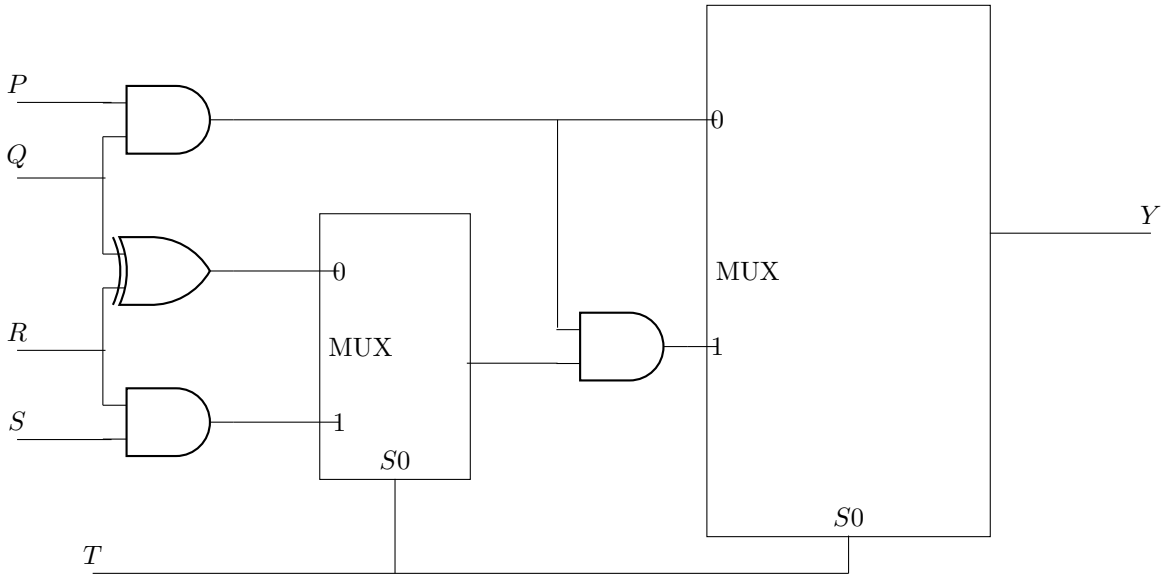
The below circuit is to be implemented using the 7447 IC.



1. Components

Table 1: Table1

COMPONENTS		
Component	Value	Quantity
Resistor	220 Ohm	1
Arduino	UNO	1
Seven Segment Display		1
Decoder	7447	1
Jumper Wires	M-M	20
Breadboard		1

2. Hardware

   (a) Make Connections between the seven segment display in and the 7447 IC as shown in 2.

Table 2: Table2

7447 - Display							
7447	$\bar{a}$	b	$\bar{c}$	d	$\bar{e}$	f	$\bar{g}$
Display	a	b	c	d	e	f	g

(b) Connect Vcc of the IC and COM of the dispaly to 5V and the GND pins of the IC and display to the Ground of arduino.

3. Software

(a) Now make the connections as per 3.

Table 3: Table3

7447 - Arduino				
7447	D	C	B	A
Arduino	5	4	3	2

(b) In the truth table in 4, P,Q,R,S,T are the inputs and Y is the output.

Table 4: Table4

Truth Table					
0	x	x	x	1	0
x	0	x	x	1	0
x	x	0	x	x	0
x	x	x	0	x	0
x	x	1	1	0	1
1	1	1	1	x	1

(c) Since, 7447 is a Seven Segment Display decoder, A represents the LSB and D represents the MSB. So giving the input to A displys either 0 or 1 on the Display.

(d) Since, the output of th mux is either 0 or 1, this output of mux i.e, Y can begiven as input to A of the 7447 IC so that the the output of the mux can be observed directly on the display.

(e) The boolean expression for the output (Y) of the second mux with the inputs (P,Q,R,S,T) will be simplified as 1

$$Y = T'PQ + PQRST. \tag{1}$$

(f) The code below realizes the Boolean logic for A with y being the input to A.

```
//Declaring and initializing all variables as integers

int P=0,Q=0,R=0,S=0,T=0;
int A,B,C,D;

//function for A,B,C,D ins of 7447 IC

void disp(int D,int C,int B,int A){
digitalWrite(2,A);//LSB
digitalWrite(2,A);
digitalWrite(2,A);
digitalWrite(2,A);//MSB }

//the setup function runs once when you press reset or
power the board

void setup(){
pinMode(2,OUTPUT);
pinMode(3,OUTPUT);
pinMode(4,OUTPUT);
pinMode(5,OUTPUT);
}

//the loop function runs over and over again forever

void loop(){
A=(!T&&R&&S)||(P&&Q&&R&&S&&T);
B=0;
C=0;
D=0;
disp(D,C,B,A);
}
```

(g) Execute the above code and compare the results of output theoretically and practically.