Assignment 3

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FPGA Assignment-3

1 Introduction

We have to perform the problem presented in Assignment-1 on arduino and verify the output. **Draw the truth table for the inputs nd outputs given above and write POS expressions for it Assignment-3 Implement above program in Arduino using assembly language.**

2 SOLUTION

A	B	C	D	X
0	0	0	0	0
0	0	0	1	0
0	0	1	0	0
0	0	1	1	1
0	1	0	0	0
0	1	0	1	1
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	1
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

Table 1: Truth Table

3 Code

```
.include "m328Pdef.inc"

Start:
ldi r17, 0b11000011 ; identifying input pins 10,11,12,13
out DDRD,r17 ; declaring pins as input
ldi r17, 0b11111111 ;
out PORTD,r17 ; activating internal pullup for pins 10,11,12,13
in r17,PINB

ldi r20,0b00000010
rcall loopr

ldi r21,0b00000001
and r21,r17 ;s
lsr r17
ldi r22,0b00000001
and r22,r17 ;r
lsr r17
ldi r23,0b00000001
and r23,r17 ;q
lsr r17
ldi r24,0b00000001
and r24,r17 ;p


ldi r25,0b00000001
ldi r26,0b00000001

eor r26,r24     ;p'
eor r25,r23     ;q'

            mov r27,r21
com r27    ;s'
            mov r28,r22
            com r28    ;r'


            mov r19,r26
            mov r20,r27
            and r19,r20     ;p's'
            mov r31,r19
            com r31          ;(p's')'
```

```
            mov r19,r24
            mov r20,r25
            and r19,r20     ;pq'
            mov r30,r19
            com r30          ;(pq')'



             mov r19,r23
             mov r20,r22
             and r19,r20     ;qr
             mov r29,r19
             com r29          ;(qr)'

             mov r19,r29
             mov r20,r25
             mov r17,r28
             and r19,r20     ;p'q'
             and r17,r19     ;p'q'r'
             mov r23,r17
             com r23          ;(p'q'r')'



             mov r19,r26
             mov r20,r28
             mov r17,r21
             and r19,r20     ;p'r'
             and r19,r17    ;p'r's
             mov r27,r19
             com r27          ;(p'r's)'


and r31,r30
             and r31,r29
             and r31,r23
             and r31,r27




rcall loopl

ldi r16, 0b00100000 ;identifying output pins 2,3,4,5
out DDRB,r16 ;declaring pins as output
out PORTB,r31 ;writing output to pins 2,3,4,5
```

```
rjmp Start

loopr: lsr r17
dec r20
brne loopr
ret

loopl: lsl r31
dec r20
brne loopl
ret
```

4 Result

```
The assignment has been completed and truth table isverified.
```

Implemented the above truth table in Arduino. The inputs A,B,C equivalent are displayed on seven segment display and its corresponding output is displayed with LED.
Steps:
1. Login into ubuntu and go to avra-1.3.0 folder
2. In avra-1.3.0 folder open src folder and write program in assign3.asm
3. One program was written to display LHS truth table and other to display RHS truth table.
4. Compile the program to generate the hex file.
5. After generating the hex file save it on laptop and load it in Arduino usng XLoader.