

# Assignment

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## QUESTION

For the given boolean expression  $f = \bar{a}\bar{b}\bar{c} + \bar{a}b\bar{c} + a\bar{b}\bar{c} + abc + ab\bar{c}$ , the minimized Product of Sum (POS) expression is

### 1 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

TABLE I

1. The table given below is the connections between 7447 BCD Decoder and Seven Segment Display

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

TABLE II

2. The figure given below is the pin diagram of Seven Segment Display.

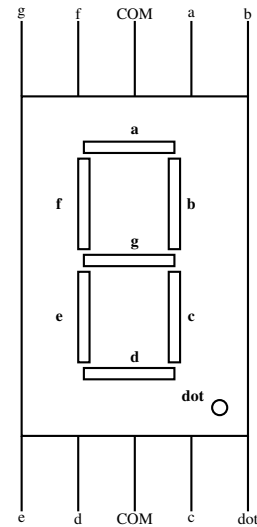


Fig. 1

3. The diagram below shows the pin diagram of 7447 BCD Decoder. The output pins of 7447 are connected to Seven Segment Display using Table 2.

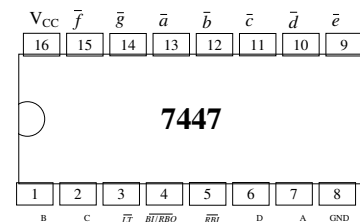


Fig. 2

## 2 TRUTHTABLE

a	b	c	f
0	0	0	1
0	0	1	0
0	1	0	1
0	1	1	0
1	0	0	1
1	0	1	0
1	1	0	1
1	1	1	1

## 3 K-MAP

		bc			
		00	01	11	10
a	0	1	0	0	1
	1	1	0	1	1

The minimized expression is  $f=(b+\bar{c})(a+\bar{c})$

## 4 PROCEDURE

- 1) The given boolean expression is  $f=\bar{a}\bar{b}\bar{c}+\bar{a}b\bar{c}+a\bar{b}\bar{c}+abc+ab\bar{c}$   
from this we can write the minimized POS expression as follows

$$\begin{aligned}
 f &= \bar{a}\bar{b}\bar{c} + \bar{a}b\bar{c} + a\bar{b}\bar{c} + abc + ab\bar{c} \\
 &= \bar{a}\bar{c}(\bar{b} + b) + a\bar{c}(\bar{b} + b) + abc \\
 &= \bar{a}\bar{c} + a\bar{c} + abc \quad (\text{additive identity } [\bar{b}+b=1]) \\
 &= \bar{c}(\bar{a} + a) + abc \\
 &= \bar{c} + abc \quad (\text{additive identity } [\bar{a}+a=1]) \\
 &= (\bar{c} + b)(\bar{c} + a)(\bar{c} + c) \quad (\text{distributive law } A+BC=(A+B)(A+C)) \\
 &= (b + \bar{c})(a + \bar{c}) \quad (\text{additive identity } [\bar{c}+c=1])
 \end{aligned}$$

- 2) connect the circuit using 7447 BCD-Seven segment display decoder and Arduino.
- 3) connect the seven segment pins to 7447 using Table 2.
- 4) connect the pin A of 7447 to D13 of Arduino and remaining pins B,C and D to GND.

5) connect the pins D2,D3,D4 to 0's and 1's. Change the pins simultaneously to verify the POS expression truth table.

- 6) Verify the minimized POS expression operation in assembly using the following code and making pin connections according to fig 2, Table 2

Observe the truth table and verify the program by executing the link provided below.

<https://github.com/Shantipriya1919/fwc1>