

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.

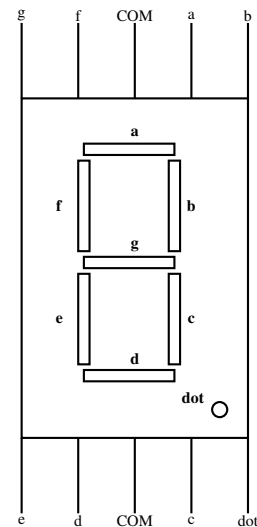


Fig. 1

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.

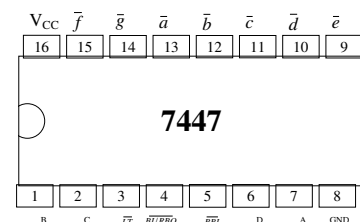


Fig. 2

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 D2 of Arduino and remaining pins B,C and D to GND.

5) connect the pins D8,D9,D10 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 avr-gcc 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>