

QuestionsNo 01

Marks

(20)

You are provided with two figures. Figure 1 is a 10 x 5 Programmable Array Logic (PAL)circuit whereas Figure 2 is a 5 x 3 Programmable Logic Array (PLA) circuit. You are required to write An ABEL code/expression for both circuits.

PAL: 10 Inputs (I1, I2, I3, I4, I5, I6, I7, I8, I9, I10) & 5 Outputs (O1, O2, O3, O4, O5).

PLA: 5 Inputs (O1, O2, O3, O4, O5) & 3 Outputs (X, Y, Z).

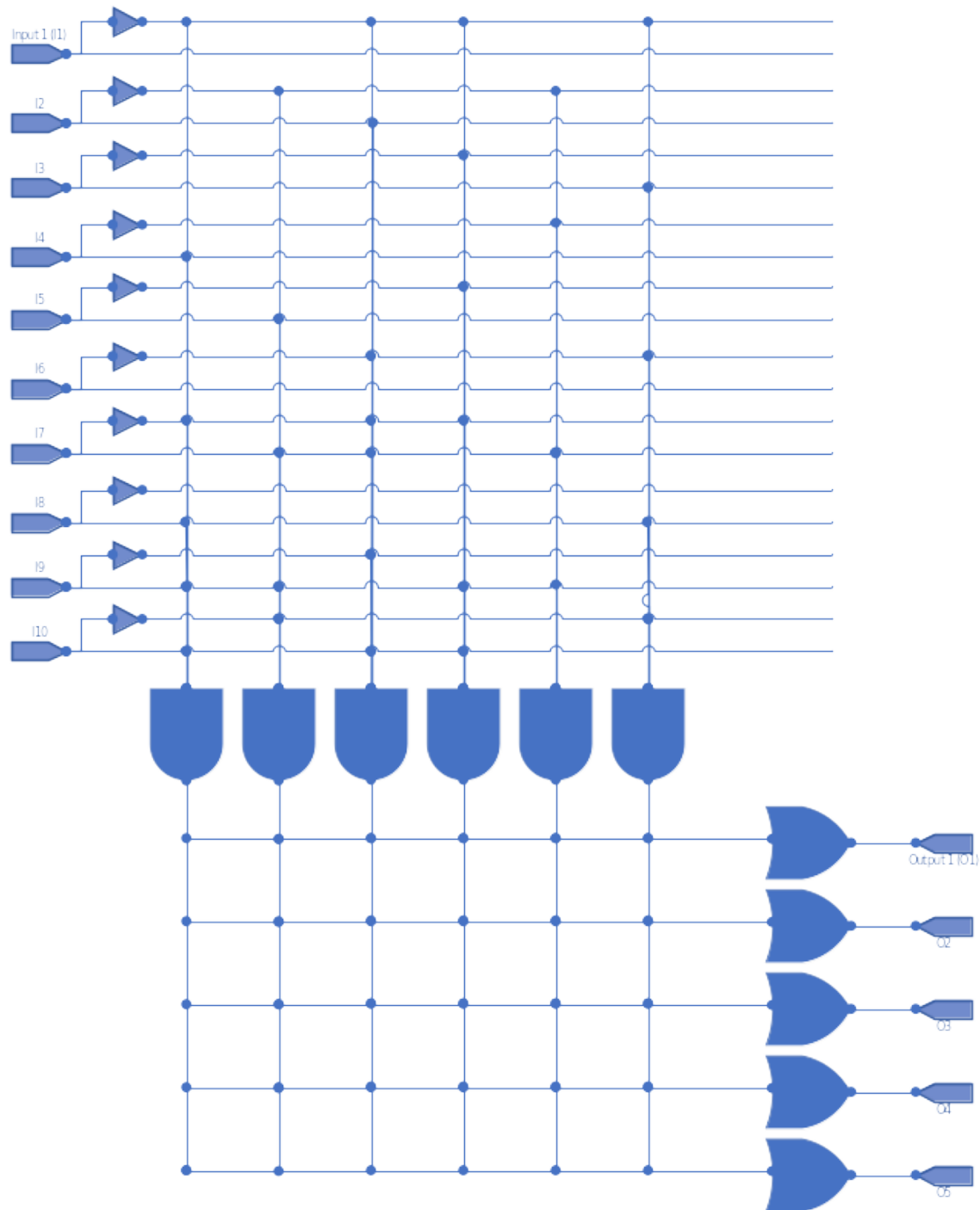


Figure 1: Programmable Array Logic (PAL)

SOLUTION:

PAL Circuit and Programming

A simplified PAL structure is shown where the AND array has been programmed to generate product terms which are added together by the OR array. Figure 1

Now we will find the the product terms (p)

$$P1 = i1' . i4 . i7' . i8 . i9 . i10$$

$$P2 = i2' . i5 . i7 . i9 . i10'$$

$$P3 = i1' . i2 . i6' . i7' . i7 . i9' . i10$$

$$P4 = i1' . i3' . i5' . i7' . i9 . i10$$

$$P5 = i2' . i4' . i7 . i9$$

$$P6 = i1' . i3 . i6' . i8' . i10'$$

Now we add together product terms

$$O = P1 + P2 + P3 + P4 + P5 + P6$$

$$O = [i1' . i4 . i7' . i8 . i9 . i10 + i2' . i5 . i7 . i9 . i10' + i1' . i2 . i6' . i7' . i7 . i9' . i10 + i1' . i3' . i5' . i7' . i9 . i10 + i2' . i4' . i7 . i9 + i1' . i3 . i6' . i8' . i10']$$

NOW we write ABEL Expression

The NOT, AND, OR and XOR operations have special symbols in ABEL as shown

Logic Operation ABEL Symbol

NOT = !

AND = &

OR = #

XOR = \$

$$O = P1 \# P2 \# P3 \# P4 \# P5 \# P6;$$

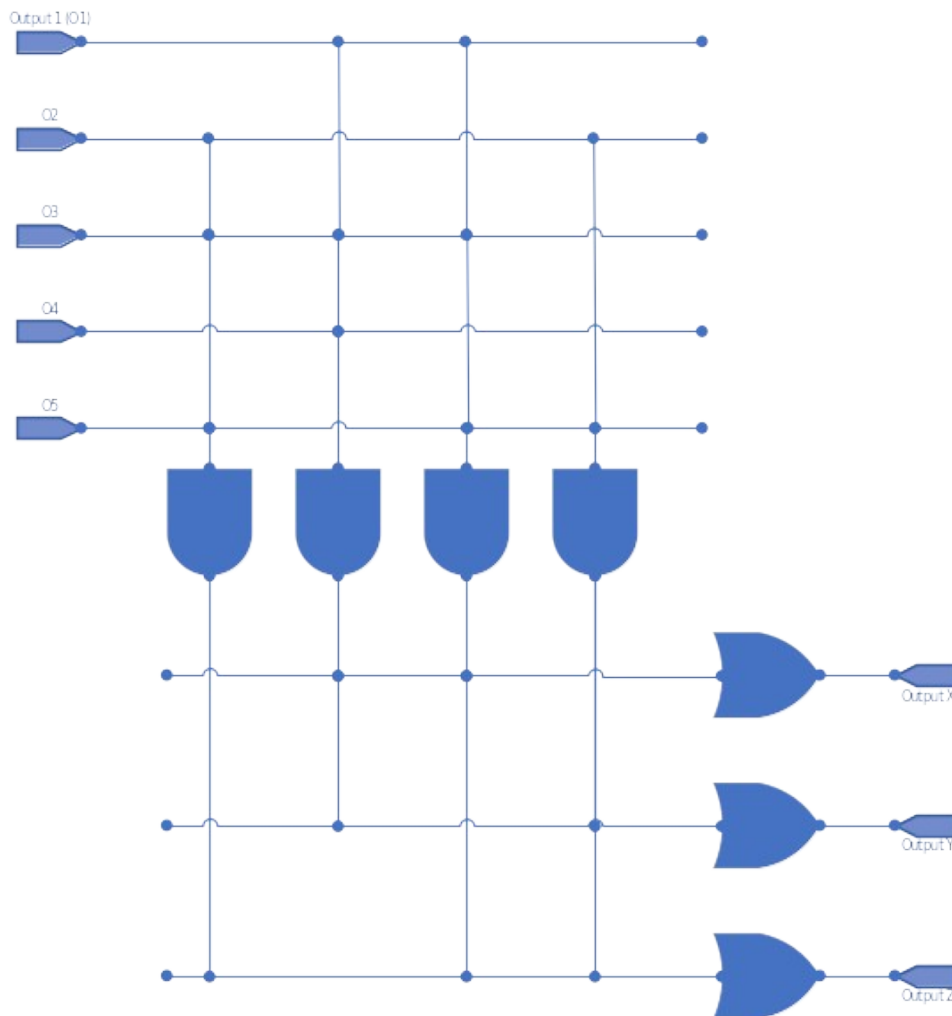
$$O = !i1 \& i4 \& !i7 \& i8 \& i9 \& i10 \# !i2 \& i5 \& i7 \& i9 \& !i10 \# !i1 \& i2 \& !i6 \& !i7 \& i7 \& !i9 \& i10 \# !i1 \& !i3 \& !i5 \& !i7 \& i9 \& i10 \# !i2 \& !i4 \& i7 \& i9 \# !i1 \& i3 \& !i6 \& !i8 \& !i10;$$

Figure 2:

PLA (programmable logic Array)

CS 302 assignment no 3 solution

NOTE : Submit this assignment on your own risk



Solution: Programmable Logic Array as mentioned earlier has a programmable AND and OR arrays. A PLA can be programmed to implement any Sum-of-Product logic expressions, limited by the parameters of the PLA device.

NOW we generate product terms

$$P1 = O2.O3.O5$$

$$P2 = O1.O3.O4$$

$$P3 = O1.O3.O5$$

$$P4 = O2.O5$$

The first OR gate sums product terms P2 and P3. For these product terms are seen to be intact. The second OR gate sums the product terms P2 and P4. The third OR gate sums the product terms P1, P3 and P4. The three sum-of-product terms are

$$\text{Output X} = P2 + P3$$

$$\text{Output y} = P2 + P4$$

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Output $z = P1 + P3 + P4$

Now

Output $x = O1.O3.O4 + O1.O3.O5$

Output $y = O1.O3.O4 + O2.O5$

Output $z = O2.O3.O5 + O1.O3.O5 + O2.O5$

NOW we write ABEL Expression :

Output $x = O1 \& O3 \& O4 \# O1 \& O3 \& O5$

Output $y = O1 \& O3 \& O4 \# O2 \& O5$

Output $z = O2 \& O3 \& O5 \# O1 \& O3 \& O5 \# O2 \& O5$