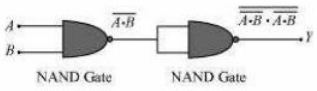
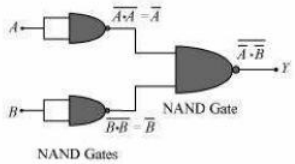


Hence, the output of the combination of the two NAND gates is given as:

$$Y = \overline{\left(\overline{A \cdot B}\right) \cdot \left(\overline{A \cdot B}\right)} = \overline{\overline{AB}} + \overline{\overline{AB}} = AB$$

Hence, this circuit functions as an AND gate.

(b) $\overline{A}$ is the output of the upper left of the NAND gate and $\overline{B}$ is the output of the lower half of the NAND gate, as shown in the following figure.



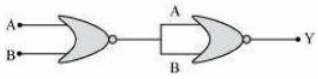
Hence, the output of the combination of the NAND gates will be given as:

$$Y = \overline{A} \cdot \overline{B} = \overline{\overline{A}} + \overline{\overline{B}} = A + B$$

Hence, this circuit functions as an OR gate.

Question 14.18:

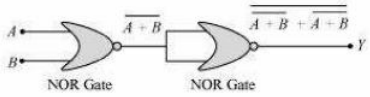
Write the truth table for circuit given in Fig. 14.47 below consisting of NOR gates and identify the logic operation (OR, AND, NOT) which this circuit is performing.



(Hint: A = 0, B = 1 then A and B inputs of second NOR gate will be 0 and hence Y=1. Similarly work out the values of Y for other combinations of A and B. Compare with the truth table of OR, AND, NOT gates and find the correct one.)

Answer

A and *B* are the inputs of the given circuit. The output of the first NOR gate is $\overline{A + B}$. It can be observed from the following figure that the inputs of the second NOR gate become the out put of the first one.



Hence, the output of the combination is given as:

$$Y = \overline{\overline{A + B} + \overline{A + B}} = \overline{\overline{A} \cdot \overline{B}} + \overline{\overline{A} \cdot \overline{B}}$$

$$= \overline{\overline{A} \cdot \overline{B}} = \overline{\overline{A}} + \overline{\overline{B}} = A + B$$

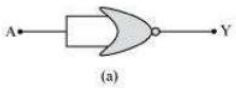
The truth table for this operation is given as:

A	*B*	*Y* (=*A* + *B*)
0	0	0
0	1	1
1	0	1
1	1	1

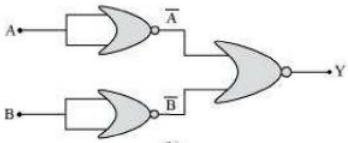
This is the truth table of an OR gate. Hence, this circuit functions as an OR gate.

Question 14.19:

Write the truth table for the circuits given in Fig. 14.48 consisting of NOR gates only. Identify the logic operations (OR, AND, NOT) performed by the two circuits.



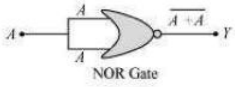
(a)



(b)

Answer

(a) *A* acts as the two inputs of the NOR gate and *Y* is the output, as shown in the following figure. Hence, the output of the circuit is $\overline{A + A}$.



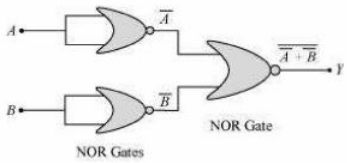
Output, $Y = \overline{A + A} = \overline{A}$

The truth table for the same is given as:

A	*Y* $\left(=\overline{A}\right)$
0	1
1	0

This is the truth table of a NOT gate. Hence, this circuit functions as a NOT gate.

(b) *A* and *B* are the inputs and *Y* is the output of the given circuit. By using the result obtained in solution **(a)**, we can infer that the outputs of the first two NOR gates are $\overline{A}$ and $\overline{B}$, as shown in the following figure.



$\overline{A}$ and $\overline{B}$ are the inputs for the last NOR gate. Hence, the output for the circuit can be written as:

$Y = \overline{\overline{A} + \overline{B}} = \overline{\overline{A}} \cdot \overline{\overline{B}} = A \cdot B$

The truth table for the same can be written as:

A	*B*	*Y* (=*A*□*B*)
0	0	0
0	1	0
1	0	0
1	1	1

This is the truth table of an AND gate. Hence, this circuit functions as an AND gate.

********** END **********