EXPERIMENT NO-3

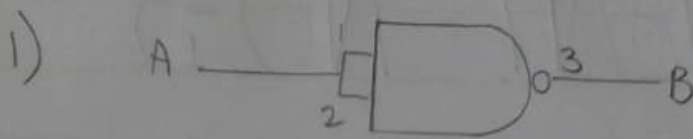Aim - To design and verify the logic gate using NAND/NOR gate

Objectives
i) Use of universal gate
ii) Realization of various gates using NAND/NOR gate

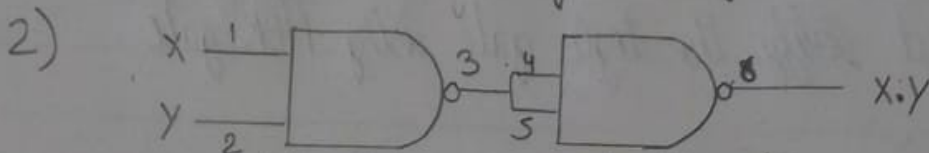Apparatus Required - IC 7402 (NOR Gate), Bread Board, Power Supply, Connecting Wires, LED

Theory

Logic Gates - A logic gate is an elementary building block of a digital circuit, more logic gates have 2 inputs and one output at any given moment, every terminal is in one of the two binary conditions LOW (0) or HIGH (1), represented by different voltage levels. In most logic gates, the low state is a approximately zero volts (0V), while the high state is approximately five volts positive (5V).
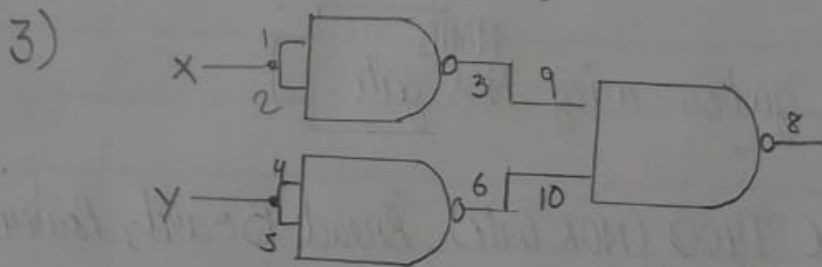
AND, OR and NOT are basic gates XOR and XNOR are derived gates. NAND and NOR gate are universal gates as any logic can be implemented using NAND or only NOR
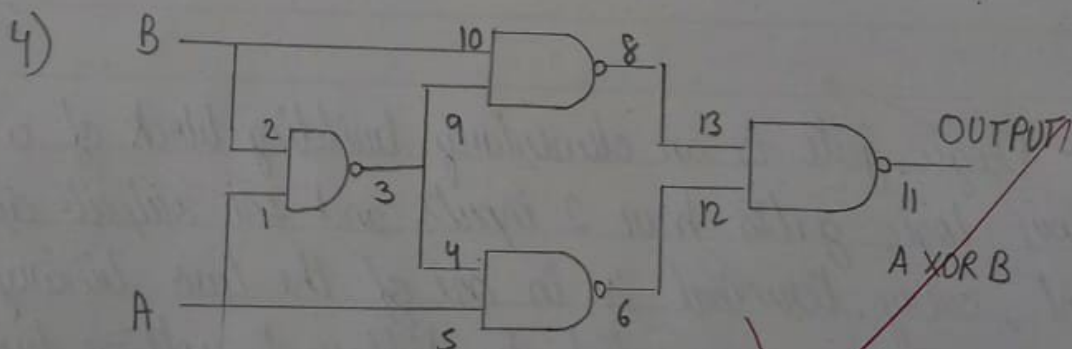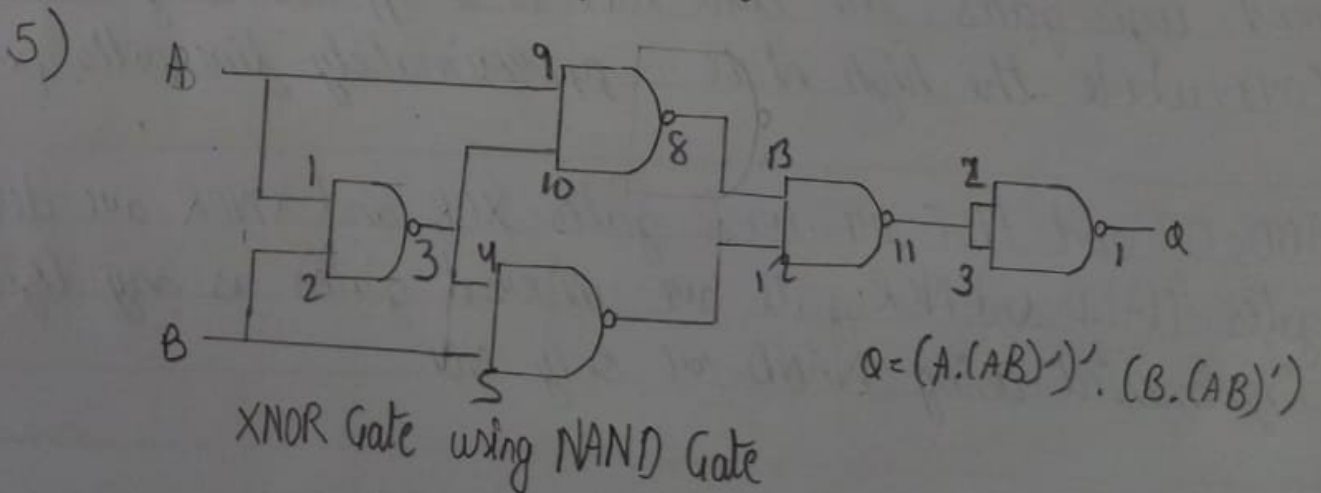
1) A

NOT Gate using NAND gate

2) X, Y

X·Y

AND Gate using NAND gate

3) X, Y

OR Gate using NAND gate

4) B, A

OUTPUT

A XOR B

XOR Gate using NAND gate

5) A, B

Q

$Q = (A.(AB)')' . (B.(AB)')$

XNOR Gate using NAND Gate

Experimental Procedure

1) Turn the power (Trainer Kit) off during circuit implementation
2) Connect the +5V and ground (GND) leads of the power supply to the power and ground bus strips on your breadboard
3) Point all the chips in the same direction with pin 1 at the upper left corner on breadboard (Pin1 is often identified by a dot or a notch next to it on the chip package).
4) Select a connection and place a piece of hook-up wire between corresponding pair pins of the chips on breadboard. It is better to make the short connections before the longer ones. Mark each connection of schematic in steps, so as not to try to make the same connection again at a larger stage
5) If an error is made and not spotted before you turn the power off immediately before reconstructing the circuit.
6) If no error is made verify the truth table of given circuit

Result - The truth tables of all gates AND, OR, NOT, XOR, XNOR, NAND and NOR gates have been verified, all gates have been realized by universal gates (NAND and NOR)

Result Analysis and Discussion - A NAND gate an inverted AND gate, and a NOR gate is inverted AND/OR gate. The output of a two input NAND gate is high when either one or both inputs are LOW

Learning Outcomes

1) Depth knowledge of basic gates ICs
2) Learning the pin description of ICs

Applications

1) NOT gates are used as oscillator to generate clock signals
2) AND gate is used in measurement of frequency of a pulsed waveform
3) EX-OR gates are used in parity generation, checking units and comparators.

Precautions

1) Turn the power off before making any connection
2) Make connection carefully

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