**Experiment No. 2**

**Aim**: Implement AND, OR, NAND, and XOR functions using basic Artificial Neural Network (ANN)

**Objectives**:

1. Understand the fundamental concepts of Artificial Neural Networks (ANN).
2. Learn to design and implement a basic ANN for simple logical functions (AND, OR, NAND, XOR).
3. Explore the working principles of neurons and connections in the context of logic gate operations.
4. Gain practical experience in training an ANN to mimic logical operations.

**Theory**:

**Artificial Neural Networks (ANN):**

ANN is a computational model inspired by the structure and functioning of the human brain. It consists of interconnected nodes (neurons) organized in layers, including input, hidden, and output layers.

**Neurons in Logic Gates:**

In the context of logic gates, neurons in the input layer represent binary inputs (0 or 1), and the output layer represents the result of a logical operation (0 or 1). The connections between neurons have associated weights that determine the influence of each input.

**AND, OR, NAND, XOR Gates:**

AND Gate: Outputs 1 only if both inputs are 1.

OR Gate: Outputs 1 if at least one input is 1.

NAND Gate: Outputs 0 only if both inputs are 1.

XOR Gate (Exclusive OR): Outputs 1 if inputs are different.

**Implementation Steps:**

1. Define the structure of the neural network with an appropriate number of input and output neurons.
2. Initialize weights and biases randomly.
3. Implement the activation function (e.g., step function or sigmoid) to simulate logical operations.
4. Prepare training data sets for each logic gate (AND, OR, NAND, XOR).
5. Train the neural network using the training data sets.
6. Evaluate the performance of the trained network on test data.

**Conclusion**:

Implementing AND, OR, NAND, and XOR functions using a basic Artificial Neural Network provides insights into how neural networks can learn and mimic logical operations. This experiment helps bridge the gap between theoretical understanding and practical implementation of simple neural networks for specific tasks. The knowledge gained can be extended to more complex applications in the field of artificial intelligence.