1. An artificial neuron is a computational unit that receives input signals, processes them using a set of weights and a bias, and generates an output signal. It consists of three main components: input terminals, weights and a bias, and an activation function. The input terminals receive inputs from other neurons or from external sources. The weights and a bias determine the strength of the input signals and the output signal of the neuron, respectively. The activation function processes the weighted sum of the inputs and the bias to produce an output signal. The artificial neuron is similar to a biological neuron in that both receive input signals, process them, and generate an output signal. However, the artificial neuron is a simplified model of the biological neuron.

2. The different types of activation functions popularly used are:

- Step function: This function generates a binary output (0 or 1) based on whether the input is greater or less than a certain threshold value.

- Sigmoid function: This function generates an output between 0 and 1 by applying a sigmoid function to the weighted sum of the inputs and the bias. It is used in logistic regression and artificial neural networks.

- ReLU function: This function generates an output equal to the input if it is positive, and 0 otherwise. It is used in deep learning and convolutional neural networks.

- Tanh function: This function generates an output between -1 and 1 by applying a hyperbolic tangent function to the weighted sum of the inputs and the bias.

3.

1. Rosenblatt’s perceptron model is a type of supervised learning algorithm that uses a single-layer neural network to classify input data into two categories. The perceptron model consists of input nodes, weights, a bias, an activation function, and an output node. The input nodes receive input data, and the weights and bias determine the output of the activation function. The output node produces a binary output based on the output of the activation function. A set of data can be classified using a simple perceptron by iteratively adjusting the weights and bias until the model correctly classifies all data points.

2. Using a simple perceptron with weights w0 = -1, w1 = 2, and w2 = 1, the data points (3, 4), (5, 2), (1, -3), (-8, -3), and (-3, 0) can be classified as follows:

- (3, 4) → 1

- (5, 2) → 1

- (1, -3) → 0

- (-8, -3) → 0

- (-3, 0) → 0

2. The basic structure of a multi-layer perceptron consists of an input layer, one or more hidden layers, and an output layer. The input layer receives input data, the hidden layers perform computations on the input data, and the output layer produces the final output. The multi-layer perceptron can solve the XOR problem by using a hidden layer with non-linear activation functions such as the sigmoid function. The hidden layer allows the model to learn non-linear relationships between the inputs and outputs, which is required to solve the XOR problem.

3. An artificial neural network (ANN) is a machine learning model inspired by the structure and function of the human brain. Some salient highlights of the different architectural options for ANN are:

- Single-layer feedforward network: This is the simplest type of ANN, consisting of an input layer and an output layer. It can be used for simple classification and regression tasks.

- Multi-layer feedforward network: This type of ANN consists of one or more hidden layers in addition to the input and output layers. It is used for more complex classification and