**SNS COLLEGE OF TECHNOLOGY, COIMBATORE –35**
(An Autonomous Institution)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**III CSE -19CST302 - NEURAL NETWORKS AND DEEP LEARNING**

**QUESTION BANK**
**2 marks**

1. **What is Deep Learning?**

**Deep learning** is a subset of machine learning that is entirely based on artificial neural networks. Because neural networks are designed to mimic the human brain, deep learning is likewise a human brain mimic. We don't have to explicitly program everything in deep learning. We train a model on a training dataset and improvise it until the model predicts almost correctly on the testing and validation dataset as well.

2. **What are the Applications of deep learning?**

Following are some of the applications of deep learning:

- Pattern recognition and natural language processing.
- Recognition and processing of images.
- Automated translation.
- Analysis of sentiment.
- System for answering questions.
- Classification and Detection of Objects.
- Handwriting Generation by Machine.
- Automated text generation.

3. **What are the advantages of neural networks?**

Following are the advantages of neural networks:

- Neural networks are extremely adaptable, and they may be used for both classification and regression problems, as well as much more complex problems.

- Once the neural network mode has been trained, they deliver output very fast. Thus, they are time-effective.

**4. What are the disadvantages of neural networks?**

Following are the disadvantages of neural networks:-

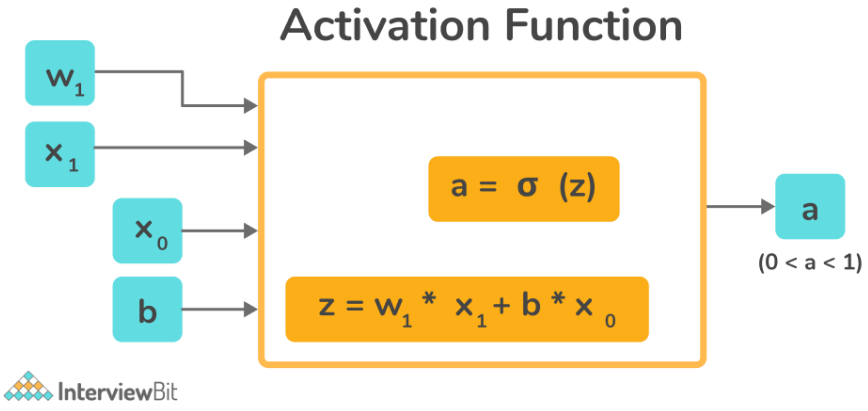
- The "black box" aspect of neural networks is a well-known disadvantage. That is, we have no idea how or why our neural network produced a certain result. When we enter a dog image into a neural network and it predicts that it is a duck, we may find it challenging to understand what prompted it to make this prediction.
- It takes a long time to create a neural network model.
- Neural networks models are computationally expensive to build because a lot of computations need to be done at each layer.
- A neural network model requires significantly more data than a traditional machine learning model to train.

**5. Explain Forward in deep learning.**

- **Forward Propagation:** The hidden layer, between the input layer and the output layer of the network, receives inputs with weights. We calculate the output of the activation at each node at each hidden layer, and this propagates to the next layer until we reach the final output layer. We go forward from the inputs to the final output layer, which is known as the forward propagation.

**6. What is an activation function? What is the use of an activation function?**

- An artificial neural network's activation function is a function that is introduced to help the network learn complex patterns in the data. When compared to a neuron-based model seen in our brains, the activation function is responsible for determining what is to be fired to the next neuron at the end of the process. In an ANN, an activation function performs the same job. It takes the preceding cell's output signal and turns it into a format that may be used as input to the next cell.

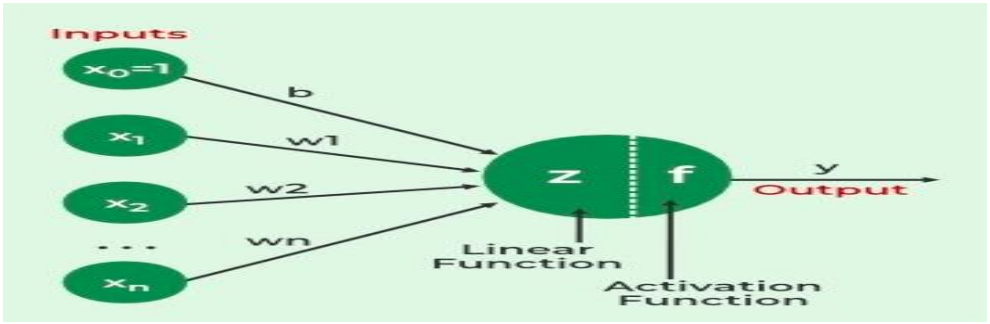


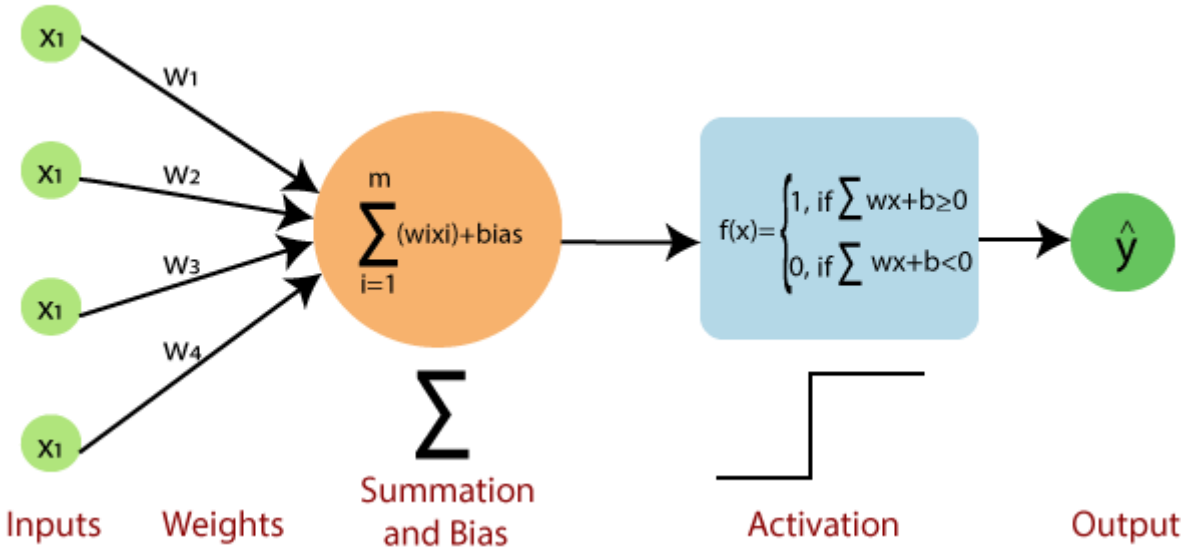
**7. What are the applications of Deep Learning?**

Deep learning has many applications, and it can be broadly divided into computer vision, natural language processing (NLP), and reinforcement learning.

- Computer vision
- Natural language processing (NLP)
- Reinforcement learning

**8. How Biological neurons are similar to the Artificial neural network.**



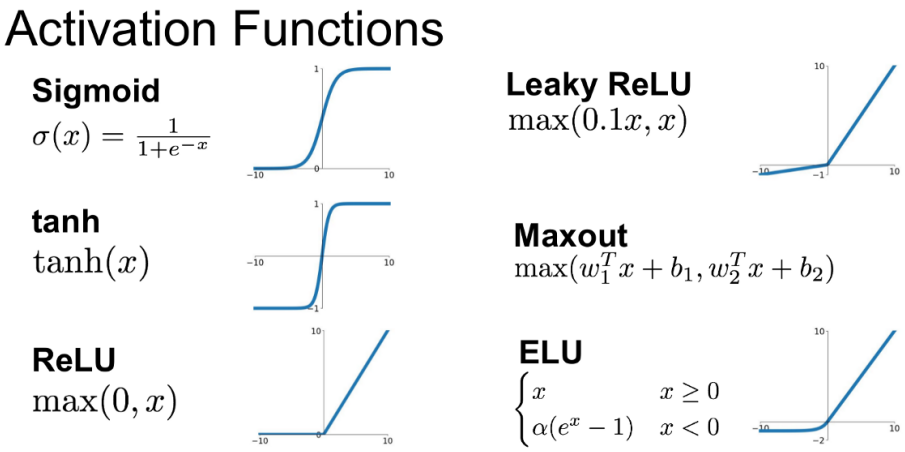

**9. What are activation functions?**

Sigmoid activation functions are used in logistic regression models. They map input values to output values between 0 and 1.

Tanh activation functions are used in many types of neural networks. They are similar to sigmoid activation functions but map input values to output values between -1 and 1.

ReLU activation functions are used in many types of neural networks. They are the most popular type of activation function. ReLU stands for a rectified linear unit. ReLU

activation functions are linear when the input is positive and zero when the input is negative.




**10. What are the different layers in ANN? What is the notation for representing a node of a particular layer?**

There are commonly three different types of layers in an artificial neural network (ANN):

- **Input Layer:** This is the layer that receives the input data and passes it on to the next layer. The input layer is typically not counted as one of the hidden layers of the network.
- **Hidden Layers:** The input layer is the one that receives input data and transfers it to the next layer. Usually, the input layer is not included in the list of the hidden layers of the neural network.
- **Output Layer:** This is the output-producing layer of the network. A binary classification problem might only have one output neuron, but a multi-class classification problem might have numerous output neurons, one for each class

**11. What are the different different types of activation functions used in deep learning?**

In deep learning, several different-different types of activation functions are used. Each of them has its own strength and weakness. Some of the most common activation functions are as follows.

- **Sigmoid function:** It maps any value between 0 and 1. It is mainly used in binary classification problems. where it maps the output of the preceding hidden layer into the probability value.
- **Softmax function:** It is the extension of the sigmoid function used for multi-class classification problems in the output layer of the neural network, where it maps the output of the previous layer into a probability distribution across the classes, giving each

class a probability value between 0 and 1 with the sum of the probabilities over all classes is equal to 1.

**12. What is overfitting and how to avoid it?**

Overfitting is a problem in machine learning that occurs when the model learns to fit the training data too close to the point that it starts catching up on noise and unimportant patterns. Because of this, the model performs well on training data but badly on fresh, untested data, resulting in poor generalization performance.

To avoid overfitting in deep learning we can use the following techniques:

1. **Simplify the model:** Overfitting may be less likely in a simpler model with fewer layers and parameters. In practical applications, it is frequently beneficial, to begin with a simple model and progressively increase its complexity until the desired performance is attained.
2. **Regularization:** Regularization is a technique used in machine learning to prevent the overfitting of a model by adding a penalty term, it imposes the constraint on the weight of the model

**13. Define the learning rate in Deep Learning.**

The learning rate in deep learning is a hyperparameter that controls how frequently the optimizer adjusts the neural network's weights when it is being trained. It determines the step size to which the optimizer frequently updates the model parameters with respect to the loss function. so, that losses can be minimized during training.

**14. Explain multilayer perceptron.**

**Ans.:** The Multilayer Perceptron (MLP) model features multiple layers that are interconnected in such a way that they form a feed-forward neural network. Each neuron in one layer has directed connections to the neurons of a separate layer. It consists of three types of layers: the input layer, output layer and hidden layer.

**15. What is vanishing gradient problem?**

**Ans.:** When back-propagation is used, the earlier layers will receive very small updates compared to the later layers. This problem is referred to as the vanishing gradient problem. The vanishing gradient problem is essentially a situation in which a deep multilayer feed-forward network or a recurrent neural network (RNN) does not have the ability to propagate useful gradient information from the output end of the model back to the layers near the input end of the model.

**16. Explain advantages deep learning.**

**Ans.:** Advantages of deep learning:

• No need for feature engineering
• DL solves the problem on the end-to-end basis.
• Deep learning gives more accuracy

**17. Explain back propagation.**

**Ans.:** Backpropagation is a training method used for a multi-layer neural network. It is also called the generalized delta rule. It is a gradient descent method which minimizes the total squared error of the output computed by the net.

**18. Explain disadvantages of deep learning**

**Ans.:** Disadvantages of deep learning

• DL needs high-performance hardware.
• DL needs much more time to train
• it is very difficult to assess its performance in real world applications
• it is very hard to understand

**19. Explain need of hidden layers.**

**Ans.:**

1. A network with only two layers (input and output) can only represent the input with whatever representation already exists in the input data.

2. If the data is discontinuousor non-linearly separable, the innate representation is inconsistent, and the mapping cannot be learned using two layers (Input and Output).

3. Therefore, hidden layer(s) are used between input and output layers.

**20.Explain activation functions.**

**Ans.:**Activation functions also known as transfer function is used to map input nodes to output nodes in certain fashion. It helps in normalizing the output between 0 to 1 or - V1 to 1. The activation function is the most important factor in a neural network which decided whether or not a neuron will be activated or not and transferred to the next layer.

**21.What Do You Understand by Backpropagation?**

This is one of the most frequently asked deep learning interview questions. Backpropagation is a technique to improve the performance of the network. It backpropagates the error and updates the weights to reduce the error.

**22.What is gradient descent?**

Gradient descent is the core of the learning process in machine learning and deep learning. It is the method used to minimize the cost or loss function by iteratively adjusting the model parameters i.e. weight and biases of the neural layer. The objective is to reduce this disparity, which is represented by the cost function as the difference between the model's anticipated output and the actual output.

**23.How do you optimize a Deep Learning model?**

A Deep Learning model may be optimized by changing its parameters and hyperparameters to increase its performance on a particular task. Here are a few typical methods for deep learning model optimization:

- Choosing the right architecture
- Adjusting the learning rate
- Regularization
- Data augmentation
- Transfer learning
- Hyperparameter tuning

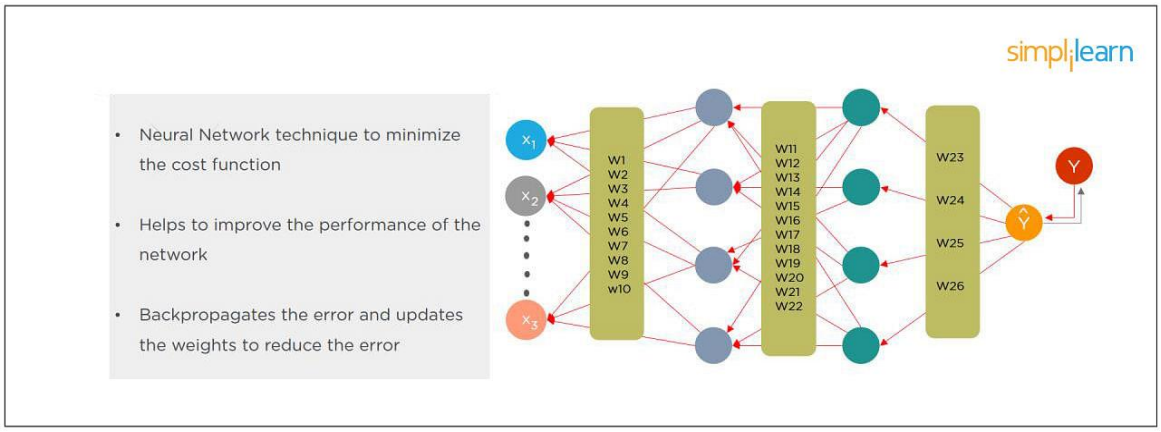
**24.What is a Deep Learning framework?**

- A deep learning framework is a collection of software libraries and tools that provide programmers a better deep learning model development and training possibilities.
- It offers a high-level interface for creating and training deep neural networks in addition to lower-level abstractions for implementing special functions and topologies.
- TensorFlow, PyTorch, Keras, Caffe, and MXNet are a few of the well-known frameworks for deep learning.

**25.What do you mean by vanishing or exploding gradient descent problem?**

- Deep neural networks experience the vanishing or exploding gradient descent problem when the gradients of the cost function with respect to the parameters of the model either become too small (vanishing) or too big (exploding) during training.
- In the case of vanishing gradient descent, The adjustments to the weights and biases made during the backpropagation phase are no longer meaningful because of very small

values. As a result, the model could perform poorly because it fails to pick up on key aspects of the data.

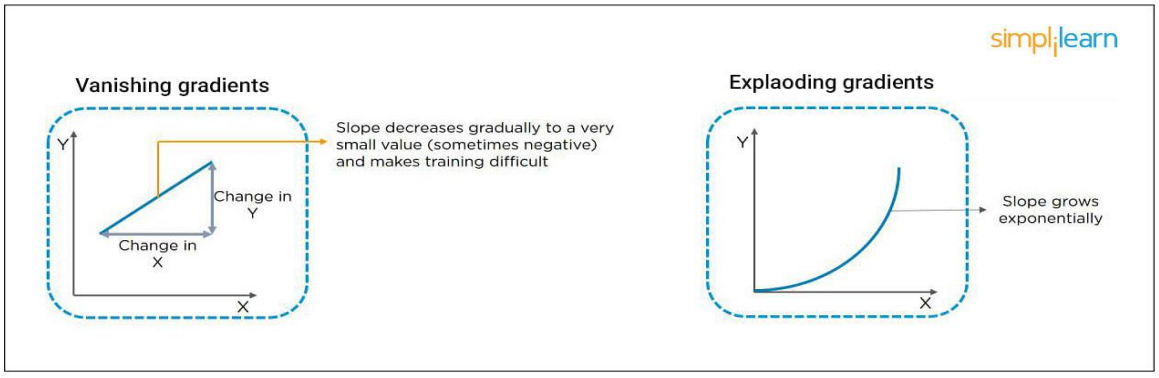



## 26. What is over fitting?

Overfitting occurs when the model learns the details and noise in the training data to the degree that it adversely impacts the execution of the model on new information. It is more likely to occur with nonlinear models that have more flexibility when learning a target function. An example would be if a model is looking at cars and trucks, but only recognizes trucks that have a specific box shape.

## 27. What Are Vanishing and Exploding Gradients?

While training an RNN, your slope can become either too small or too large; this makes the training difficult. When the slope is too small, the problem is known as a "Vanishing Gradient." When the slope tends to grow exponentially instead of decaying, it's referred to as an "Exploding Gradient." Gradient problems lead to long training times, poor performance, and low accuracy.



**28. Why is Tensor flow the Most Preferred Library in Deep Learning?**

Tensorflow provides both C++ and Python APIs, making it easier to work on and has a faster compilation time compared to other Deep Learning libraries like Keras and Torch. Tensorflow supports both CPU and GPU computing devices.

**13 Marks**

**1.** Examine the error rate using Feed Forward Neural Network

2 Analyze the importance of activation functions in neural networks and provide examples of commonly used functions.

3.Compare Single Layer Neural Network and Multilayer Neural Network with real time example

4. How the Gradient descent concept helps us to in making predictions in deep Neural Networks? Justify with your answer.

5. Analyze the impact of the Vanishing Gradient Problem and how to improve initialization and activation function in Deep Learning Models

6. Find the total error at the output for a given neural network using back propagation

7. Simplify a perceptron to solve simple OR problem with two inputs and obtain the output of the neuron Y

8. Calculate the error rate in feed forward Neural Network by performing Forward

9. What is Deep Neural Network? Compare Deep Neural Network with artificial Neural Network

10. Explain the role of differentiation algorithms in training neural networks, and how do they impact learning efficiency?