

**Mid-Semester Examination 2023**  
**Birla Institute of Technology Pilani**

**Subject: Deep Learning for Business (MPBA –G514)**

**Full Marks = 50**

1. *There are three sections in the paper.*
2. *Section-A carry multiple choice questions.*
3. *Answer to all the section is mandatory.*

**Section A: Multiple Choice Questions (2 marks each)**

**2x10 = 20 Marks**

- I. Which of the following is not a component of a basic artificial neuron?
- a. Activation Function
  - b. Bias
  - c. Weights
  - d. Input Layer
- II. What is the primary purpose of the activation function in an artificial neuron?
- a. To compute the weighted sum of inputs
  - b. To introduce non-linearity
  - c. To adjust the learning rate
  - d. To determine the number of layers in the network
- III. In supervised learning, what is the role of the output layer in an artificial neural network?
- a. It computes the weighted sum of inputs.
  - b. It provides the predicted output or classification result.
  - c. It applies the activation function.
  - d. It stores the training data.
- IV. What is the purpose of the backpropagation algorithm in training an artificial neural network?
- a. To calculate the loss function
  - b. To propagate errors backward and update weights
  - c. To prevent overfitting
  - d. To initialize the network weights

V. Which of the following techniques is used to combat the vanishing gradient problem in deep neural networks?

- a. Weight regularization
- b. Batch normalization
- c. Gradient clipping
- d. Feature scaling

VI. What is the main advantage of using a radial basis function (RBF) activation function in neural networks?

- a. It is computationally efficient.
- b. It can model complex non-linear relationships.
- c. It is suitable for image data.
- d. It doesn't require any training.

VII. What is the purpose of the learning rate in gradient descent optimization?

- a. To control the size of weight updates
- b. To determine the number of hidden layers
- c. To choose the activation function
- d. To specify the batch size

VIII. In a feedforward neural network, what is the typical structure of connections between layers?

- a. Fully connected
- b. One-to-one connections
- c. No connections
- d. Random connections

IX. Which type of artificial neural network is specifically designed for pattern recognition tasks?

- a. Perceptron
- b. Radial Basis Function Network
- c. Hopfield Network
- d. Autoencoder

X. What is the primary limitation of a single-layer perceptron?

- a. It can only solve linearly separable problems.
- b. It requires a large amount of training data.

- c. It cannot have an activation function.
- d. It is computationally expensive.

### **Section B: Short Answer Questions (any five)**

**4x5 = 20**

1. What is the purpose of the bias term in a neural network? How does the bias term contribute to the network's ability to learn and make predictions? Provide a brief explanation of how biases are incorporated into the network's computations.
2. Differentiate between the terms "*overfitting*" and "*underfitting*" in the context of training artificial neural networks. Provide examples for each.
3. Explain the concept of backpropagation in neural networks and its role in the training process. How does backpropagation help adjust the neural network's weights and biases to minimize the error between predicted and actual outputs?
4. What is the purpose of the sigmoid activation function in neural networks? Discuss its properties and limitations.
5. Explain the role of the hidden layers in a multi-layer feedforward neural network. Why are they necessary, and how do they contribute to the network's performance?
6. Explain the concept of vanishing gradients in the context of neural networks. Discuss the potential consequences of vanishing gradients during training and how this issue can impact the performance of a neural network. Provide at least one technique or architectural modification that can be used to mitigate the vanishing gradient problem.

### **Section C: Long Answer Questions (Any Two)**

**5x2 = 10**

- A. Discuss different optimizers used in deep neural network and their pros and cons.
- B. Discuss the role of activation functions in Artificial Neural Networks. Provide examples of commonly used activation functions and explain when each is appropriate.
- C. Explain the concept of regularization in neural networks. What is the primary goal of regularization techniques, and why are they important in the training process? Provide an example of one common regularization method and briefly describe how it helps prevent overfitting in neural networks.