**Question Bank: Introduction to Neural Networks**

**A. Fundamentals of Neural Networks (1–5)**

1. What is a **biological neuron** and how does it inspire artificial neural networks?
2. Explain the structure and function of a **perceptron**.
3. What is a **multilayer feed-forward neural network**, and how does it differ from a single-layer perceptron?
4. Define **forward propagation** and explain its role in neural networks.
5. Describe the process and purpose of **backpropagation** in training neural networks.

**B. Activation Functions (6–10)**

1. Compare **linear** and **non-linear** activation functions. Why is non-linearity important?
2. Describe the **Sigmoid** activation function and its limitations.
3. What are the advantages of using **ReLU (Rectified Linear Unit)** over Sigmoid or Tanh?
4. Define and compare **Tanh** and **Hard Tanh** functions.
5. What is the purpose of the **Softmax** activation function and where is it commonly used?

**C. Loss Functions (11–15)**

1. What is a **loss function** in neural networks? Why is it important?
2. Differentiate between **loss functions for regression** and **classification**.
3. Give examples of **loss functions** used for **regression problems**.
4. Explain **cross-entropy loss** and when it is used.
5. What is a **reconstruction loss function** and in which tasks is it typically applied?

**D. Hyperparameters (16–19)**

1. Define the term **hyperparameter** in the context of neural networks.
2. How does the **learning rate** affect neural network training?
3. What is the role of **momentum** in gradient-based learning?
4. Explain the concepts of **regularization** and **sparsity** in deep networks.

**E. Deep Feedforward Networks & XOR (20–23)**

1. Why can't a single-layer perceptron solve the **XOR problem**?
2. How do **hidden units** help in solving non-linear problems like XOR?
3. Describe how **cost functions** guide the training of a deep neural network.
4. Outline the steps involved in **gradient-based learning** using backpropagation.

**F. Miscellaneous (24–25)**

1. What is the difference between **training error** and **generalization error**?
2. Explain the relationship between **number of hidden layers**, **model complexity**, and **computational cost** in deep neural networks.