**Deep Learning Mid Exam**

**Max marks- (20 Marks) Date – 28-01-2025**

1. Activation Functions (6 Marks)

1. Explain the purpose of activation functions in a neural network.
2. Discuss the following activation functions with their mathematical expressions, graphs, and advantages:
3. Sigmoid
4. Tanh
5. Softmax

2. Backpropagation Algorithm (6 Marks)

1. Describe the working of the backpropagation algorithm in training a neural network.
2. Why is backpropagation considered essential in deep learning models?

3. Numerical Problem on Backpropagation (8 Marks)

Consider a neural network with:

* 2 input units
* 2 hidden units
* 1 output unit

The input to the network is [0.9,0.3], the target output is 0.7, and the network uses a sigmoid activation function. Assume the initial weights for all connections are 0.5, and the learning rate is 0.1.

1. Compute the output of the network using the forward pass.
2. Perform one iteration of backpropagation to update the weights, showing all steps clearly, including:
3. Error calculation
4. Gradients for each weight
5. Weight updates.