Pre Lab:-

1. What is the primary objective of the gradient descent algorithm in the context of deep learning?
The primary objective is to minimize the cost function by iteratively adjusting model parameters to reduce the error between predicted and actual values.

2. Explain the role of the learning rate in the gradient descent update rule. How does it influence the convergence and stability of the optimization process?
The learning rate controls the size of the steps taken towards the minimum of the cost function; a small rate ensures stable convergence, while a large rate may cause overshooting or instability.

3. What is the significance of a cost function in deep learning, and how does it relate to the objective of optimization using gradient descent?
The cost function measures the error between predicted and actual values, guiding gradient descent to adjust model parameters to minimize this error and improve performance.

4. How might the choice of learning rate impact the convergence speed of the gradient descent algorithm?
A larger learning rate can speed up convergence but may overshoot, while a smaller rate ensures precise convergence but can slow down the process.

VIVA:-

1. Define Gradient Descent.
Gradient Descent is an optimization algorithm used to minimize a cost function by iteratively adjusting model parameters in the direction of the negative gradient to reduce the error.

2. Explain the Role of Learning Rate in Gradient Descent.
The learning rate determines the step size in each iteration; it influences how quickly the algorithm converges to the minimum and affects the stability of the updates.

3. How does the shape of the cost function influence the convergence behavior of gradient descent?
The shape affects convergence speed and direction; a smooth, convex cost function allows for faster and more reliable convergence, while complex or non-convex functions may lead to slower convergence or local minima.

4. How might a small learning rate impact convergence, and what issues can arise with a large learning rate?
A small learning rate can lead to slow convergence and longer training times, while a large learning rate may cause overshooting, instability, or divergence from the optimal solution.