Question 2:

AdaBoost Approach:
- AdaBoost is an approach that uses several classifiers to improve the classifier accuracy.
- AdaBoost classifier combines a number of ineffective classifiers to create a strong classifier that has a high degree of accuracy.
- The fundamental idea underlying Adaboost is to train the data sample and set the classifier weights in each iteration in a way that provides accurate predictions of uncommon observations.
- On a variety of weighed training instances, the classifier should be trained interactively.
- It strives to minimize training errors in order to offer the best match possible for these instances in each iteration.

sklearn.ensemble. AdaBoostClassifier:
sklearn.ensemble. AdaBoostClassifier(base_estimator=None, n_estimators=50)

- Here, base_estimator indicates the base estimator used to fit the dataset.
- By default, when base_estimator is None, then Decision Tree the base estimator is the Decision Tree Classifier.
- n_estimators indicates the number of estimators in the ensemble model

Experimenting with the different number of base predictors for the AdaBoost Approach:
Tried different numbers of base predictors for the AdaBoost approach. The following table shows how the accuracy of the model changes when the number of base predictors changes:

SL NO	n_estimators	Test Accuracy
1	50	95.90%
2	100	94.73%
3	25	95.32%
4	75	94.73%

Observations:
- The test accuracy is highest when n_estimators is equal to 50 which is 95.90%
- When increasing the number of base predictors to 75 and 100, the accuracy decreases to 94.73 and 94.73% respectively.
- Similarly, when decreasing the number of base predictors to 25, the accuracy decreases to 95.32% respectively.

Experimenting with the different learning_rate values for the AdaBoost Approach:
Tried different numbers values for learning_rate for the AdaBoost approach. The following table shows how the accuracy of the model changes when the rate of learning_rate changes:

SL NO	learning_rate	Test Accuracy
1	1	94.73%
2	0.1	96.49%

SL NO	learning_rate	Test Accuracy
3	0.5	97.07%

Observations:
- The test accuracy is highest when learning_rate is 0.5 which is 97.07%.
- The test accuracy decreases when learning_rate is increased or decreased. The test accuracy is 94.73% when the learning rate is 1 and the test accuracy is 96.49% when the learning_rate is 0.1.

Bagging Approach:
- The Bagging classifier fits base classifiers one at a time to random subsets of the original dataset.
- And then it aggregates the individual predictions to provide a final prediction.
- By adding randomization to the process, a meta-estimator of this kind can often be used to lower the variance of the estimator.

sklearn.ensemble.BaggingClassifier:
sklearn.ensemble.BaggingClassifier(base_estimator=None, n_estimators=50)

- Here, base_estimator indicates the base estimator used to fit the dataset.
- By default, the base estimator is the Decision Tree Classifier.
- n_estimators indicates the number of estimators in the ensemble model

Experimenting with the different number of base predictors for the Bagging Approach:
Tried different numbers of base predictors for the Bagging approach. The following table shows how the accuracy of the model changes when the number of base predictors changes:

SL NO	n_estimators	Test Accuracy
1	10	95.32%
2	50	95.90%
3	75	96.49%
4	100	95.90%

Observations:
- The test accuracy is lowest when n_estimators is equal to 10 which is 95.32%
- Increased the number of estimators, i.e, n_estimators to 50, 75, and 100, and observed that the accuracy increased compared to when n_estimators = 10.

Experimenting with the different values of max_samples the Bagging Approach:
Tried different numbers of max_samples for the Bagging approach. The following table shows how the accuracy of the model changes when the number of max_samples changes:

SL NO	max_samples	Test Accuracy
1	2	90.64%

SL NO	max_samples	Test Accuracy
2	1	95.90%
3	3	93.56%

Observations:
- The test accuracy is highest when max_samples is equal to 1 which is 95.90%.
- When increasing the number of max_samples to 2 and 3, the accuracy decreases to 90.94% and 93.56% respectively.