Machine Learning

(**Answersheet)**

Ans 1 :- R-Square is a better measure compare to Residual sum of squres(RSS) for the fit regression Model. Becauase R-squared is the absolute amount of variation as a proportion of total Variation.

Ans2:- TSS - TSS(Total sum of squres) is a quantity that appears as part of standard way of presenting Result of such analyses.

RSS- RSS(Residual sum of squares) is a statistical technique used to measure the amount of Variance in a data set. It estimate the variance in the residuals or error term.

ESS- ESS(explained sum of squares) is a statistical quantity used in modelling of a process. ESS gives an estimate of how well a model explains the observed data for the process.

Equation relating these three metrics with each other……

$$\sum_{i=1}^{n}(yi - \bar{y})^2 = \sum_{i=1}^{n}(\hat{y}i - \bar{y})^2 + \sum_{i=1}^{n}(yi - \hat{y}i)^2$$

Ans 3:- Regularization is technique used to prevent overfitting by adding a penalty term to the loss function , this couraging the model from assigning too much importance to individual features or coefficients. let's explore some more detailed explanations about the role of regularization in python.

Ans 4:- Gini impurtity measures how well does a node splits the data set between the two outcomes.

Ans 5:- Yes, Beacause the more comlex the model the higher , model, chance that it will overfitt the overfitted model has too many features.

Ans 6:- Ensemble methods are techniques that create multiple models and then combine them to produce improved results.

Ans 7:-Bagging is the simplest way of combining predictions that belong to the same type. While Boosting is a way of combining predictions that belong to the different types.

Ans 8:- Out-of-bag(OOB) error is method of measuring the prediction error of random forests boosted decision trees and other machine learning model utilizing bootstrap aggregating.

Ans 9:- K-fold Cross-Validation is when the dataset is split into a K number of fold and used to evaluate the models ability when given new data.

Ans 10:- A Hyperparameter in machine learning is a parameter such as the learning rate or choice of optimizer , which specifies details of the learning process, hence the name hyperparameter. Hyperparameters directly control model structure, function, and performance. Hyperparameter tuning allows data scientist to tweak model performance for optimal results.

Ans 11:- If the learning rate is too high, the algorithm may overshoot the minimum. Gradient descent can overfit the training data if the model is the learning rate is too high.

Ans 12:- Non-linear problems can't be solved with logistics regression Because it has a linear decision surface.

Ans 13:- The Most significant difference is that gradient boosting minimizes a loss function like MSE or log loss while AdaBoost focuses on instances with high error by adjusting theit sample weights adaptively.

Ans 14:- The bias-variance tradeoff in machine learning is describes the relationship between a model's complexity , the accuracy of its preductions and how well it can make predictions on previously unseend data that were not used to train the model.

Ans 15:- Linear kernel :- linear kernel produces a decision boundary that is a hyperplane in the feature space. this hyperplane seprates data points from different classes in a linear fashion.

RBF:- Radial basis function kernel(RBF) is a popular kernel function used in various kernelized learning algorithms.

KPM:- The Kernel polynomial method(KPM) can be used to quickly compute various physical properties of very large tight binding systems.