Time: 3hrs **[Total Marks:80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) Assume suitable data, if required and state it clearly.

Q1 Attempt any **FOUR** from the following [20]

A Explain how to choose the right algorithm for machine learning application.

B Explain Linear Discriminant Analysis.

C Explain any five performance measures along with example.

D Differentiate between Logistic regression and Support vector machine.

E Explain the following Receiver operating characteristics curve and Area under curve.

Q2 A Explain clustering with minimal spanning tree with reference to Graph based clustering. [10]

B Explain the terms overfitting, underfitting, bias & variance tradeoff w.r.t. Machine Learning. [10]

Q3 A Explain the concept of regression and enlist its types. A clinical trial gave the data for BMI and Cholesterol level for 10 Patients as shown in table below. Identify the machine learning method used to solve the above problem and predict the likely value of Cholesterol level for someone who has BMI of 27. [10]

BMI	17	21	24	28	14	16	19	22	15	18
Cholesterol	140	189	210	240	130	100	135	166	130	170

B Explain the necessity of cross validation in Machine learning applications and K-fold cross validation in detail. [10]

Q4 A Explain support vector machine as a constrained optimization problem. [10]

B Explain the concept of decision tree. Consider the dataset given in a table below. The dataset has 3 features as Past Trend, Open interest, Trading volume and one class label as Return. Compute the Gini Index for all features and specify which node will be chosen as a root node in decision tree. [10]

Past Trend	Open Interest	Trading Volume	Return
Positive	Low	High	Up
Negative	High	Low	Down
Positive	Low	High	Up
Positive	High	High	Up
Negative	Low	High	Down
Positive	Low	Low	Down
Negative	High	High	Down
Negative	Low	High	Down
Positive	Low	Low	Down
Positive	High	High	Up

Q5 A Explain kernel Trick in support vector machine. [10]

B Explain different ways to combine classifiers. [10]

Q6 Write any **TWO** from the following [20]

A Explain multiclass classification techniques.

B Explain in detail Principal Component Analysis for Dimensionality reduction

C Explain DBSCAN algorithm along with example

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