Answer as many questions as you can. Maximum you can score is 50 marks

1. Explain (with step by step details) of carrying out principal component regression and ridge regression?   [8]

2. An analytical professional wants to develop a model using multiple linear regression. Explain the various methods to check the following?   [8]

   a) Model significance

   b) Model accuracy

   c) Model adequacy

   d) Model generalisability

3. Describe two methods to improve the predictive accuracy of tree-based models? The following information on models developed from a dataset using three different supervised learning techniques is given below. Compute various accuracy measures and suggest the best model?◉   [12]

Technique	Regression Tree		Random Forest		Bagging	
Data set	Training	Test	Training	Test	Training	Test
Residual Sum of Squares	6514.14	2622.38	4860.44	2000.02	4748.15	2260.12
Variance of Response	85.0891	83.7008	85.0891	83.7008	85.0891	83.7008
Number of Values	380	126	380	126	380	126

4. Describe the leave one out (LOOCV) and k - fold cross validation methods? A chemical engineer has developed models to estimate the yield of a process using ridge regression. He has developed models using two different λ values. The λ and coefficients of the models are given in the next page.   [15]

λ	Intercept	x_1	x_2	x_3
1.19	-61.22	0.08	-119.76	0.33
2.31	-49.08	0.07	-129.96	0.31

Validate the models using the test data given below and identify the better model?

SL No.	X₁	X₂	X₃	yield (y)
1	1300	0.012	7.5	49
2	1300	0.0135	17	47.5
3	1200	0.038	7.5	31.5
4	1200	0.034	17	38
5	1100	0.098	7.5	17
6	1100	0.092	11	20.5

5. A telecom service provider wants to enhance the broadband customer base. The company has conducted a conjoint analysis to obtain the customer preferred plans. The details of the conjoint analysis with the aggregate ranking are given below. Analyze the data, compute part worth utilities and importance scores. What suggestions can you provide to the telecom service provider to maximize the broadband customer base?◉ [12]

Combinations	Bandwidth	Monthly Charges (Rs.)	Download / Upload Limit	Additional Usage Fee	Score
1	1.0 Mbps	375	1.5 GB	Rs. 0.15 / MB	8.2
2	1.0 Mbps	500	2.0 GB	Rs. 0.30 / MB	3.4
3	1.0 Mbps	630	2.5 GB	Rs. 0.50 / MB	1.3
4	1.5 Mbps	375	2.0 GB	Rs. 0.50 / MB	6.3
5	1.5 Mbps	500	2.5 GB	Rs. 0.15 / MB	9.2
6	1.5 Mbps	630	1.5 GB	Rs. 0.30 / MB	1.1
7	2.0 Mbps	375	2.5 GB	Rs. 0.30 / MB	9.3
8	2.0 Mbps	500	1.5 GB	Rs. 0.50 / MB	3.9
9	2.0 Mbps	630	2.0 GB	Rs. 0.15 / MB	6.8