

N.B.

- i. Attempt any **TWO** questions among question numbers 1, 2, 3, and any **TWO** questions among questions 4, 5, 6.
- ii. Figures to the right indicate full marks.
- iii. Simple non-programmable calculator is allowed.

1. (a) Define classification problem. (05)

(b) For each attribute of the following table write three classification rules of your choice and find the total error corresponding to each attribute using 1R classifier. According to you which is the best attribute and corresponding rules. Justify your answer. (05)

Outlook	Temperature	Humidity	Windy	Class
Sunny	Hot	High	False	N
Sunny	Hot	High	True	N
Overcast	Hot	High	False	Y
Rain	Mild	High	False	Y
Rain	Cool	Normal	False	Y
Overcast	Cool	Normal	True	Y
Sunny	Mild	High	False	N
Sunny	Cool	Normal	False	Y

(c) Consider the following weather report: (05)

Outlook	Temperature		Humidity		Windy		Play			
	Yes	No	Yes	No	Yes	No	Yes	No		
Sunny	2	3	Hot 2	2	High 3	4	False 6	2	9	5
Overcast	4	0	Mild 4	2	Normal 6	1	True 3	3		
Rainy	3	2	Cold 3	1						

Use Bayes rule and decide if there is a cricket play with outlook = sunny, temperature = cool, humidity = high, windy = true.

2. (a) What is cluster Analysis? What do you mean by outliers in cluster analysis? (05)
Is it true that “Clusters are formed using un-supervised learning” Justify your answer.

- (b) For the following construct a graph that shows all the edges corresponding to data and hence draw dendrogram. (05)

Item	A	B	C	D	E
A	0	1	2	2	3
B	1	0	2	4	3
C	2	2	0	1	5
D	2	4	1	0	3
E	3	3	5	3	0

- (c) Six observations on two variables are available, as shown in the following table: (05)

Observations	p	q	r	s	t	u
X ₁	3	4	2	5	1	4
X ₂	2	1	5	2	6	2

- (i) Plot the observations in a scatter diagram. How many groups would you say there are and what are their members?
 (ii) Apply the k-mean method, assuming that the observation belongs to two groups that one of these groups consists of p and t.

3. (a) Explain market basket analysis concept. Support your answer by giving two examples. (05)

- (b) Calculate support and confidence for the rule $YP \rightarrow X$ with the help of following information: (05)

TID	1	2	3
Item Bought	{R,X,P,Y}	{P,X,Z,Q,Y}	{Z,X,Y,Q}

- (c) What do you mean by frequent item set? Use Apriori algorithm to generate frequent item sets for the following by taking support threshold as 60 % . (05)

TID	100	200	300	400	500
Item Bought	{X, Y}	{X, Z, P, Q}	{Y, Z, P, R}	{X, Y, Z, P}	{X, Y, Z, R}

4. (a) Obtain the equation for the set point of the manipulatable variable by the method of FBA. (07)

- (b) Explain Response Surface Methodology by a suitable example. (04)

- (c) Describe the nature of any three quality characteristics for S/N ratios for static problem. (04)

- 5. (a) Bring out the difference between Engineering process control and statistical process control. (05)

- (b) State the important steps in Robust Design. (05)

- (c) Write a short note on Evolutionary operation (05)

- 6. (a) Briefly explain the analysis of ordered categorical data. (05)

- (b) Explain the association of S/N ratio and quality loss after adjustment (σ_a) (05)

- (c) Describe the control factors for the polysilicon deposition process. (05)
