

Time: 3 Hours

N.B.:

1. Question No.1 is compulsory.
2. Attempt any **Three** questions out of remaining **Five** questions.
3. Figures to the right indicate full marks.
4. Assume any suitable data wherever required but justify the same.

- Q.1**
- a) Explain the key terminologies of Support Vector Machine. 5
  - b) What are the key tasks of Machine Learning? 5
  - c) Explain the concepts behind Linear Regression. 5
  - d) Explain in brief elements of Reinforcement Learning. 5
- Q.2**
- a) Explain the steps required for selecting the right machine learning algorithm. 8
  - b) For the given data determine the entropy after classification using each attribute for classification separately and find which attribute is best as decision attribute for the root by finding information gain with respect to entropy of Temperature as reference attribute. 12

Sr. No.	Temperature	Wind	Humidity
1	Hot	Weak	Normal
2	Hot	strong	High
3	Mild	Weak	Normal
4	Mild	Strong	High
5	Cool	Weak	Normal
6	Mild	Strong	Normal
7	Mild	Weak	High
8	Hot	Strong	Normal
9	Mild	Strong	Normal
10	Cool	Strong	Normal

- Q.3**
- a) Apply k-means algorithm on given data for  $k=2$ . Use  $C_1(2, 4)$  &  $C_2(6, 3)$  as initial cluster centres. 10  
Data: a(2, 4), b(3, 3), c(5, 5), d(6, 3), e(4, 3), f(6, 6)
  - b) Explain classification using Bayesian Belief Network with an example. 10
- Q.4**
- a) Define Support vector machine (SVM) and further explain the maximum margin linear separators concept. 10
  - b) Explain in detail Principal Component Analysis for Dimension Reduction. 10
- Q.5**
- a) Explain reinforcement learning in detail along with the various elements involved in forming the concept. Also define what is meant by partially observable state. 10

- b) Apply Agglomerative clustering algorithm on given data and draw dendrogram. Show three clusters with its allocated points. Use single link method. 10

Adjacency Matrix:

	a	b	c	d	e	f
a	0	$\sqrt{2}$	$\sqrt{10}$	$\sqrt{17}$	$\sqrt{5}$	$\sqrt{20}$
b	$\sqrt{2}$	0	$\sqrt{8}$	3	1	$\sqrt{18}$
c	$\sqrt{10}$	$\sqrt{8}$	0	$\sqrt{5}$	1	1
d	$\sqrt{17}$	3	$\sqrt{5}$	0	2	3
e	$\sqrt{5}$	1	1	2	0	$\sqrt{13}$
f	$\sqrt{20}$	$\sqrt{18}$	1	3	$\sqrt{13}$	0

Q.6

Write detail notes on (any two)

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- Hierarchical Clustering algorithms.
- Hidden Markov model.
- Model Based Learning