

(3 hours)

[80 Marks]

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.

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|-----|--|----|
| Q.1 | a) What are the key tasks of Machine Learning?   | 5  |
|     | b) What are the key terminologies of Support Vector Machine?   | 5  |
|     | c) Explain in brief Linear Regression Technique.   | 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	High
2	Hot	strong	High
3	Mild	Weak	Normal
4	Cool	Strong	High
5	Cool	Weak	Normal
6	Mild	Strong	Normal
7	Mild	Weak	High
8	Hot	strong	High
9	Mild	Weak	Normal
10	Hot	Strong	Normal

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|-----|---|----|
| Q.3 | a) Explain in detail Principal Component Analysis for Dimension Reduction   | 10 |
|     | b) Apply K-means algorithm on given data for k=3. Use C <sub>1</sub> (2), C <sub>2</sub> (16) and C <sub>3</sub> (38) as initial cluster centres.<br>Data: 2, 4, 6, 3, 31, 12, 15, 16, 38, 35, 14, 21, 23, 25, 30 | 10 |
| Q.4 | a) Explain in detail reinforcement technique Temporal Difference Learning.  | 10 |
|     | b) Using Bayesian classification and the given data classify the tuple(Rupesh, M, 1.73 m)   | 10 |

Attribute	Value	Count			Probability		
		Short	Medium	Tall	Short	Medium	Tall
Gender	M	1	2	3	1/4	2/7	3/4
	F	3	5	1	3/4	5/7	1/4
Height	(0, 1.6)	2	0	0	2/4	0	0
	(1.6, 1.7)	2	0	0	2/4	0	0
	(1.7, 1.8)	0	3	0	0	3/7	0
	(1.8, 1.9)	0	3	0	0	3/7	0
	(1.9, 2)	0	1	2	0	1/7	2/4
	(2, ∞)	0	0	2	0	0	2/4

- Q.5 a) Apply Agglomerative clustering algorithm on given data and draw dendogram. Show three clusters with its allocated points. Use single link method. 8

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	$\sqrt{5}$	$\sqrt{5}$	2
d	$\sqrt{17}$	1	$\sqrt{5}$	0	2	3
e	$\sqrt{5}$	1	$\sqrt{5}$	2	0	$\sqrt{13}$
f	$\sqrt{20}$	$\sqrt{18}$	2	3	$\sqrt{13}$	0

- b) Explain classification using Back Propagation algorithm with a suitable example. 12

- Q.6 Write detail notes on (any two) 20
- a) Quadratic Programming solution for finding maximum margin separation in Support Vector Machine.
  - b) Applications of Machine Learning algorithms.
  - c) Hidden Markov Model.
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