



CBCS SCHEME

15CS73

Seventh Semester B.E. Degree Examination, July/August 2021 Machine Learning

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions.

- 1 a. Explain briefly steps involved in designing the learning system. (08 Marks)
b. Use example 1 given below to obtain most generalized hypothesis.
example 1.
 $x_1 = \langle \text{Sunny, Warm, Normal, Strong, Warm, Same} \rangle +$
 $x_2 = \langle \text{Sunny, Warm, High, Strong, Warm, Same} \rangle +$
 $x_3 = \langle \text{Rainy, Cold, High, Strong, Warm, Change} \rangle -$
 $x_4 = \langle \text{Sunny, Warm, High, Strong, Cool, Change} \rangle +$ (04 Marks)
c. What are the limitations of find-S algorithm? (04 Marks)
- 2 a. Write candidate elimination algorithm and obtain version space description for the example2 given below.
Example 2:
(i) $\langle \text{Sunny, Warm, Normal, Strong, Warm, Same} \rangle = \text{Yes}$
(ii) $\langle \text{Sunny, Warm, High, Strong, Warm, Same} \rangle = \text{Yes}$
(iii) $\langle \text{Rainy, Cold, High, Strong, Warm, Change} \rangle = \text{No}$
(iv) $\langle \text{Sunny, Warm, High, Strong, Cool, Change} \rangle = \text{Yes}$ (10 Marks)
b. Use example instances given below and obtain the proper classification. Give rational behind the class assigned to each instance. Use the hypothesis determined from example 2 at Q2(a).
 $x_1 = \langle \text{Sunny, Warm, Normal, Strong, Cool, Change} \rangle = ?$
 $x_2 = \langle \text{Rain, Cold, Normal, Light, Warm, Same} \rangle = ?$
 $x_3 = \langle \text{Sunny, Warm, Normal, Light, Warm, Same} \rangle = ?$
 $x_4 = \langle \text{Sunny, Cold, Normal, Strong, Warm, Same} \rangle = ?$ (06 Marks)
- 3 a. What are the suitable characteristics to use tree based learning? (04 Marks)
b. Write ID3 algorithm and explain steps involved in it. (06 Marks)
c. Obtain decision tree for following expression:
(i) $A \wedge B$
(ii) $A \vee [B \wedge C]$
(iii) $A \text{ XOR } B$
(iv) $[A \wedge B] \vee [C \wedge D]$ (06 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg. 42+8=50, will be treated as malpractice.

- 4 a. Consider the example given in table 1. and determine suitable decision tree.

Table 1

Sl.No.	Outlook	Temperature	Humidity	Wind	Enjoy Sports
1	Sunny	Hot	High	Weak	No
2	Sunny	Hot	High	Strong	No
3	Overcast	Hot	High	Weak	Yes
4	Rain	Mild	High	Weak	Yes
5	Rain	Cool	Normal	Weak	Yes
6	Rain	Cool	Normal	Strong	No
7	Overcast	Cool	Normal	Strong	Yes
8	Sunny	Mild	High	Weak	No
9	Sunny	Cool	Normal	Weak	Yes
10	Rain	Mild	Normal	Weak	Yes
11	Sunny	Mild	Normal	Strong	Yes
12	Overcast	Mild	High	Strong	Yes
13	Overcast	Hot	Normal	Weak	Yes
14	Rain	Mild	High	Strong	No

- b. Explain limitations of ID3 algorithm. (12 Marks)
(04 Marks)
- 5 a. Using perceptron design Neural Network to solve following expression given in below truth table.

x_1	x_2	Output
0	0	0
0	1	0
1	0	0
1	1	1

- b. Write algorithm for Gradient Descent learning and explain. (04 Marks)
(08 Marks)
- c. What are the advantages of Artificial Neural Network? (04 Marks)
- 6 a. Derive the solution for weight update rule where the error is expressed as
- $$\epsilon_d(\bar{\omega}) = \frac{1}{2}(t_d - O_d)^2 \quad (08 \text{ Marks})$$
- b. Write Back propagation algorithm and explain. (08 Marks)
- 7 a. Use the following cancer diagnostic statics and priori probabilities given to determine $P(\text{cancer}/\oplus)$
- 0.008 people can have cancer.
 - Positive test is correct in 98% cases.
 - The negative test is correct in 97% cases. (06 Marks)
- b. Determine the posteriori probability for concept learning given $h \in H$ and D set of instances as training example. (06 Marks)
- c. Show that maximum likelyhood hypothesis is equivalent to sum of minimum squared error.

$$h_{ML} = \operatorname{argmin}_{h \in H} \sum_{i=1}^m (d_i - h(x_i))^2 \quad (04 \text{ Marks})$$

- 8 a. Use the example given in table 1 at Q.No.4(a) and obtain classification for following instance by applying Naïve Bay's classifier.
Outlook = Sunny, Temperature = Cool, Humidity = High
Wind = Strong (10 Marks)
- b. Explain Naïve Bay's classifier. (06 Marks)
- 9 a. Explain what is sample error and true error. (04 Marks)
b. What is confidence interval? How the confidence interval is determined? (06 Marks)
c. Write steps involved in comparing hypothesis using confidence interval. (06 Marks)
- 10 Write short note on following :
a. K-Nearest Neighbourhood learning
b. Locally Weighted Regression
c. Case Based Learning
d. Reinforced Learning (16 Marks)
