Course Code : CST 451-1   EZFY/RW – 22 / 1010

Seventh Semester B. E. (Computer Science and Engineering) Examination

Elective – III

MACHINE LEARNING

Time : 3 Hours]   [Max. Marks : 60

Instructions to Candidates :—

    (1)   All questions are compulsory.

    (2)   All questions carry marks as indicated.

    (3)   Explain your answer with neat sketches, wherever applicable.

1.   (a)   Identify the method required to overcome over-fitting in decision tree with an example.   5(CO1)

        (b)   Let us consider, you might have performed training on any dataset by using any supervised machine learning algorithm. Now, its time to evaluate the training algorithm. How will you evaluate it ? State any FIVE measures of evaluating the algorithm with an example. Consider any values in the input.   5(CO1)

2.   (a)   Explain the significance of Vapnik Chervonenkis dimension theory with an example.   5(CO2)

        (b)   Consider following dataset. X1 and X2 are the inputs and Y is an output :

X1	X2	Y
7	7	Bad
7	4	Bad
3	4	Good
1	4	Good

        Find out the value of Y for X1 = 3 and X2 = 7 by using K-nearest neighbor algorithm. Consider the value of k as 3.   5(CO4)

3. (a) Evaluate the following neural network and find out the weights after first iteration by using back-propagation neural network. Consider activation function as Unipolar Sigmoid and η is 0.9.
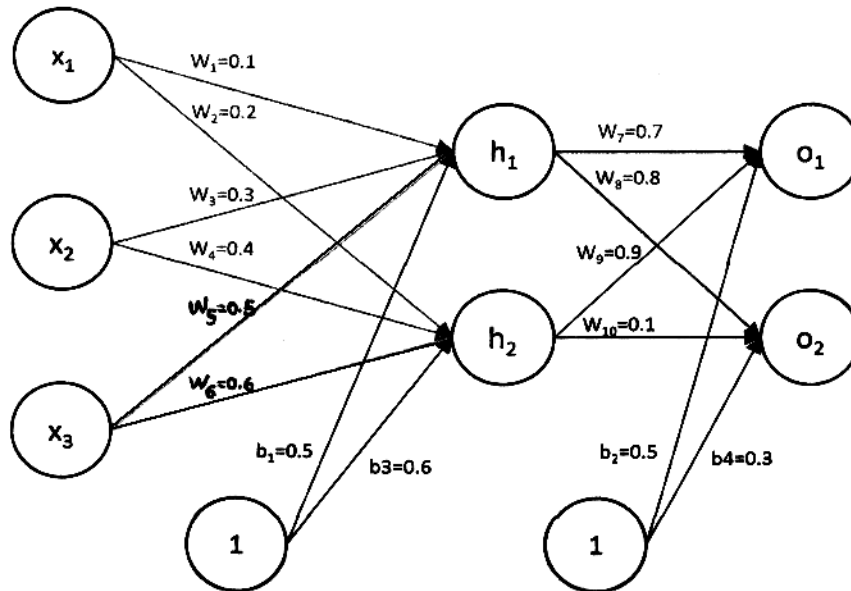
7(CO3)

(b) Write an Gradient Descent algorithm. 3(CO2)

4. (a) Compute the code length for given data set by using minimum description length principle :

Outlook	Temperature	Humidity	Wind	Play
x_1	x_2	x_3	x_4	y
sunny	hot	high	weak	no
sunny	hot	high	strong	no
overcast	hot	high	weak	yes
rain	mild	high	weak	yes
rain	cool	normal	weak	yes
rain	cool	normal	strong	no
overcast	cool	normal	strong	yes

Outlook	Temperature	Humidity	Wind	Play
x_1	x_2	x_3	x_4	y
sunny	mild	high	weak	no
sunny	cool	normal	weak	yes
rain	mild	normal	weak	yes
sunny	mild	normal	strong	yes
overcast	mild	high	strong	yes
overcast	hot	normal	weak	yes
rain	mild	high	strong	no

6(CO4)

(b)   A coin is flipped 100 times. Given that there were 55 heads, find the maximum likelihood estimate for the probability p of heads on a single toss.   4(CO4)

5.   (a)   Following are the 12 objects. Your task is to classify these objects into 3 different categories by using k-means algorithm. Find out the centroids, which you will get after first iteration. Initial cluster centres are (6.8, 5.8), (2.4, 3.9), (2.9, 7.9).   7(CO3)

A1	6.8	8.1	5.2	6.0	2.9	4.6	7.1	8.9
A2	5.8	10.3	6.4	8.0	7.9	1.8	3.6	10.3

A1	1.2	2.4	4.9	6.7
A2	8.6	3.9	10.6	13.5

(b)   Explain the significance of Bayesian learning with an example.   3(CO2)

6.   (a)   Following are the two classes with FIVE objects in each class :

Samples for class $\omega 1$: X1 = (x1, x2) = {(2, 1), (2, 7), (3, 3), (1, 6), (4, 4)}
Samples for class $\omega 2$: X2 = (x1, x2) = {(6, 9), (6, 3), (7, 1), (8, 4), (9, 3)}

Compute within-class scatter matrix for these TWO classes.   6(CO3)

(b)   Explain the significance of kernel trick in support vector machine.   4(CO2)

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