No. of Printed Pages : **2**

Sl. No.

CE1.2-R4 : MACHINE LEARNING

NOTE :

1. **Answer question 1 and any FOUR from questions 2 to 7.**
2. **Parts of the same question should be answered together and in the same sequence.**

Time : 3 Hours **Total Marks : 100**

1. (a) Define Machine Learning and explain different types of Machine learning methods.

(b) What are basic design issues in concept representation ?

(c) What are the differences between supervised and unsupervised learning ?

(d) What is Overfitting, and how it can be avoided ?

(e) Define Conditional probability.

(f) What are the different kernels functions in SVM ?

(g) Explain logistic regression with an example. **(7x4)**

2. (a) What is the objective of Machine Learning ? Discuss different applications of Machine Learning.

(b) What is the role of a function approximation algorithm ? How does learner systemestimate training values and adjusts weights while learning ? **(9+9)**

3. (a) What are steps involved in Cross validation in Machine Learning and Explain different Methods of Cross Validation ?

(b) Describe in brief :

(i) Hypothesis space search

(ii) Inductive bias **(8+10)**

4. (a) What is the use of Artificial Neural Networks ? What are its advantages ?

(b) Calculate total number of weights to be learned by the neural network having 3 inputs and 2 classes and a hidden layer with 5 neurons.

(c) Consider following sentences :

(i) Advait like all kind of food.

(ii) Guava is food.

(iii) Chicken is food

(iv) Anything anyone eats and isn't killed by is food.

(v) Sagar eats peanuts and still alive.

(vi) Vidushi eats everything Sagar eats.

Convert these statements in formulas in propositional logic and then clause form. Using resolution, prove Advait likes peanuts. **(3+5+10)**

5. (a) What is the general principle of an ensemble method and what is bagging and boosting in ensemble method ?

(b) Explain the difference between L1 and L2 regularization.

(c) What are Bayesian Belief nets? Where are they used ? **(6+6+6)**

6. (a) What is Horn Clause ? Convert following in first order predicate logic and then Horn Clause

(i) Every one is loyal to someone.

(ii) All men are mortal.

(b) What are kernels in machine learning and SVM and why do we need them?

(c) Differentiate between Regression and Classification. **(6+6+6)**

7. (a) Consider the following set of data with three Boolean input variables a, b, and c, and a single Boolean output variable K.

a	b	c	k
1	0	1	1
1	1	1	1
0	1	1	0
1	1	0	0
1	0	1	0
0	0	0	1
0	0	0	1
0	0	1	0

For parts (a) and (b), assume we are using a naive Bayes classifier to predict the value of K from the values of the other variables. Determine the following :

(i) According to the naive Bayes classifier, what is $P(K= 1 | a= 1 \wedge b= 1 \wedge c= 0)$?

(ii) According to the naive Bayes classifier, what is $P(K= 0 | a= 1 \wedge b= 1)$?

(b) Explain Bayes theorem with an example. **(10+8)**

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