Practice Questions of Machine Learning

1. Discuss the use of a decision tree for classification purposes with an example.
2. Draw and explain the decision tree for the following transaction:

Animal	Has Fur	Has Feathers	Lays Eggs	Makes Sound	Species
Dog	Yes	No	No	Yes	Mammal
Cat	Yes	No	No	Yes	Mammal
Parrot	No	Yes	No	Yes	Bird
Crocodile	No	No	Yes	No	Reptile
Eagle	No	Yes	Yes	Yes	Bird
Snake	No	No	Yes	No	Reptile
Dolphin	Yes	No	No	Yes	Mammal
Penguin	Yes	No	Yes	Yes	Bird

3. For the transactions shown in the table compute entropy, information gain, and Gini index.

Feature 1	Feature 2	Feature 3	Target Label
1	'A'	10	Yes
0	'B'	20	No
1	'C'	15	Yes
0	'A'	25	No
1	'B'	30	Yes

4. Draw the perceptron network with the notation.

5. Consider a football game between two rival teams: Team 0 and Team 1. Suppose Team 0 wins 95% of the time and Team 1 wins the remaining matches. Among the games won by Team 0, only 30% of them come from playing on Team 1's football field. On the other hand, 75% of the victories for Team 1 are obtained while playing at home. If Team 1 is to host the next match between the two teams, which team will most likely emerge as the winner?

6. The following table gives a data set about stolen vehicles. Using Naïve bayes classifier classify the new data (Red, SUV, Domestic).

Color	Type	Origin	Stolen
Red	Sports	Domestic	Yes
Red	Sports	Domestic	No
Red	Sports	Domestic	Yes
Yellow	Sports	Domestic	No
Yellow	Sports	Imported	Yes
Yellow	SUV	Imported	No

Color	Type	Origin	Stolen
Yellow	SUV	Imported	Yes
Yellow	SUV	Domestic	No
Red	SUV	Imported	No
Red	Sports	Imported	Yes

7. Explain Inductive machine learning with example?
8. A) Analyze covariance and Correlation.
   B) Suppose you are analyzing the relationship between the hours spent studying and the scores obtained by students in a particular course. You collected data from a group of 50 students. The hours spent studying (in hours) represent one variable, and the scores obtained (out of 100) represent another variable.
      i) Calculate the covariance between the hours spent studying and the scores obtained.
      ii) Compute the correlation coefficient between these two variables.

9. Contract decision tree by using ID3 and CART algorithm.
10. Explain about various Bayesian classifier.
11. Suppose there's a girl who loves swimming and has a swimming competition scheduled for tomorrow. However, today she feels a bit unwell. The chances of her feeling unwell on any given day when she is healthy are only 30%. Additionally, there's a 80% probability that she participates in swimming competitions, and if she participates, there's a 25% chance she'll feel unwell on the day of the competition. What is the probability that she will participate in the swimming competition tomorrow given that she feels unwell today?
12. Draw a hyperplane in the following points using Support vector Machine (SVM). Points (4,1), (4,-1) and (6,0) belong to positive class and points (1,0), (0,1) and (0,-1) belong to negative class.
13. Construct decision trees to represent Boolean functions.
14. What is the role of kernel. Discuss the types of Kernels.
15. Perform linear regression to predict Exam Score for given Hours Studied= 12

Hours Studied	Exam Score
2	60
3	70
4	75
5	80
6	85
7	90
8	95

16. Perform Multiple linear regression to predict House Price for a new instace where X=5000, X2= 6, X3= 15

House Size (X1)	Bedrooms (X2)	Distance to City Center (X3)	House Price (Y)
2000	3	5	300,000
1600	2	7	240,000
2400	4	3	350,000
1800	2	10	280,000
3000	5	2	400,000

17. "Suppose you're developing a machine learning model to classify emails as either 'spam' or 'not spam.' After training your model, you evaluated its performance and obtained the following results:
    a) Out of 150 emails predicted as 'spam,' 130 were actually 'spam.'
    b) Out of 100 emails predicted as 'not spam,' 90 were actually 'not spam.'

    Calculate the precision of this model in classifying 'spam' emails."

18. Compare bias and variance.
19. Analyze Linear Discriminant Analysis (LDA) and Non-Linear Discriminant Analysis (NLDA).
20. Discuss about tree pruning.