# R20

**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY::PUTTUR (AUTONOMOUS)**

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## QUESTION BANK (DESCRIPTIVE)

**Subject with Code:** MACHINE LEARNING(20MC9134)  **Course & Branch**: MCA

**Year &Sem:** II-MCA &II-Sem  **Regulation:** R20

## UNIT –I
## INTRODUCTION TO MACHIENE LEARNING

| 1 | a) | Define machine learning. | [L1][CO1] | **[2M]** |
|---|---|---|---|---|
| | b) | Give five real world examples where machine learning is used. | [L2][CO1] | **[10M]** |
| 2 | | Define the following | | |
| | a) | Learning | [L1][CO1] | **[3M]** |
| | b) | Version Space | [L1][CO1] | **[3M]** |
| | c) | Hypothesis | [L1][CO1] | **[3M]** |
| | d) | Concept | [L1][CO1] | **[3M]** |
| 3 | a) | What do you mean by a well –posed learning problem? | [L1][CO1] | **[3M]** |
| | b) | What are the important features that are required to well –define a learning problem? | [L1][CO1] | **[3M]** |
| | c) | Give three real time examples of well –posed learning problems | [L1][CO1] | **[6M]** |
| 4 | | Define the following | | |
| | a) | Deductive Learning | [L2][CO1] | **[2M]** |
| | b) | Inductive Learning | [L2][CO1] | **[2M]** |
| | c) | Biased Hypothesis | [L2][CO1] | **[2M]** |
| | d) | Unbiased Hypothesis | [L2][CO1] | **[2M]** |
| | e) | Inductive bias | [L2][CO1] | **[4M]** |
| 5 | | | | |
| | a) | Explain Find-S Algorithm | [L2][CO2] | **[6M]** |
| | b) | Explain Candidate Elimination algorithm | [L2][CO2] | **[6M]** |
| 6 | | Design a checkers learning problem | [L6][CO2] | **[12M]** |
| 7 | | Consider the following training set | | |

| example | citations | size | in Library | price | editions | buy |
|---|---|---|---|---|---|---|
| 1 | some | small | no | affordable | many | no |
| 2 | many | big | no | expensive | one | yes |
| 3 | some | big | always | expensive | few | no |
| 4 | many | medium | no | expensive | many | yes |
| 5 | many | small | no | affordable | many | yes |

| | a) | How many possible instances will be there in the instance space of the above training set? | [L1][CO1] | **[3M]** |
|---|---|---|---|---|
| | b) | How many syntactically different hypotheses will be there in the hypothesis space? | [L1][CO1] | **[3M]** |

| | | | | |
|---|---|---|---|---|
| | c) | How many semantically different hypotheses will be there in the hypothesis space? | [L1][CO1] | **[3M]** |
| | d) | Find Maximally Specific Hypothesis for the above training set using Find S algorithm | [L1][CO1] | **[3M]** |
| 8 | | List and explain perspectives and issues in Machine Learning. | | |
| 9 | a) | Define concept learning. | [L1][CO1] | **[4M]** |
| | b) | Explain concept learning as a search problem. | [L2][CO1] | **[4M]** |
| | c) | What do you mean by General-to-Specific Ordering of Hypotheses? Explain with an example. | [L2][CO1] | **[4M]** |
| 10 | | Find version space for the following training set using Candidate Elimination algorithm | [L3][CO2] | **[12M]** |

| Sno | Size | Color | Shape | Class/Label |
|---|---|---|---|---|
| 1 | Big | Red | Circle | No |
| 2 | Small | Red | Triangle | No |
| 3 | Small | Red | Circle | Yes |
| 4 | Big | Blue | Circle | No |
| 5 | Small | Blue | Circle | Yes |

# UNIT –II
## DECISION TREE LEARNING

| 1 | a) | What is a decision tree? | [L1][CO3] | **[3M]** |
|---|----|--------------------------|-----------|----------|
| | b) | How a decision tree can be constructed? | [L1][CO3] | **[3M]** |
| | c) | What are its strengths and weaknesses | [L1][CO3] | **[6M]** |
| 2 | a) | What is the entropy of this collection of training examples with respect to the target function classification? | [L1][CO3] | **[3M]** |
| | b) | What is the information gain of al and a2 relative to these training examples | [L1][CO3] | **[4M]** |
| | c) | Construct decision tree for the given dataset | [L6][CO3] | **[5M]** |

| Instance | Classification | al | a2 |
|----------|----------------|----|----|
| 1 | + | T | T |
| 2 | + | T | T |
| 3 | - | T | F |
| 4 | + | F | F |
| 5 | - | F | T |
| 6 | - | F | T |

| 3 | a) | Describe hypothesis space search in decision tree learning | [L2][CO3] | **[9M]** |
|---|----|-----------------------------------------------------------|-----------|----------|
| | b) | What are the capabilities and limitations of ID3 algorithm? | [L2][CO3] | **[3M]** |
| 4 | a) | Explain Entropy. | [L2][CO3] | **[6M]** |
| | b) | Explain Information gain. | [L2][CO3] | **[6M]** |
| 5 | | How do you estimate the accuracy of a Hypothesis? | [L2][CO3] | **[12M]** |
| 6 | a) | What is meant by Sampling? | [L1][CO4] | **[6M]** |
| | b) | What are the different methods of sampling? Discuss. | [L1][CO4] | **[6M]** |
| 7 | a) | What is a Confidence Interval? | [L1][CO4] | **[6M]** |
| | b) | How do you construct a Confidence Interval? | [L2][CO4] | **[6M]** |
| 8 | | Compare different machine learning algorithms? | [L5][CO3] | **[12M]** |
| 9 | a) | What is Hypothesis testing? | [L1][CO3] | **[6M]** |
| | b) | How Hypothesis testing can be done? | [L2][CO3] | **[6M]** |
| 10 | a) | Explain ID3 Algorithm. | [L2][CO3] | **[6M]** |
| | b) | What are its characteristics? | [L1][CO3] | **[6M]** |

## UNIT –III
### BAYESIAN LEARNING

| 1 | | The following data set contains factors that determine whether tennis is played or not. Using Naive Baycs classifier, find the play prediction for the day <Sunny, Cool, High, Strong> | [L3][CO4] | [12M] |
|---|---|---|---|---|

| DAY | OUTLOOK | TEMP | HUMIDITY | WIND | PLAY |
|---|---|---|---|---|---|
| Day 1 | Sunny | Hot | High | Weak | NO |
| Day 2 | Sunny | Hot | High | Strong | NO |
| Day 3 | Overcast | Hot | High | Weak | YES |
| Day 4 | Rain | Mild | High | Weak | YES |
| Day 5 | Rain | Cool | Normal | Weak | YES |
| Day 6 | Rain | Cool | Normal | Strong | NO |
| Day 7 | Overcast | Cool | Normal | Strong | YES |
| Day 8 | Sunny | Mild | High | Weak | NO |
| Day 9 | Sunny | Cool | Normal | Weak | YES |
| Day 10 | Rain | Mild | Normal | Weak | YES |
| Day 11 | Sunny | Mild | Normal | Strong | YES |
| Day 12 | Overcast | Mild | High | Strong | YES |
| Day 13 | Overcast | Hot | Normal | Weak | YES |
| Day 14 | Rain | Mild | High | Strong | NO |

| 2 | a) | Define VC dimension. | [L1][CO4] | [4M] |
|---|---|---|---|---|
| | b) | How do you measure the Power of a Classifier with VC Dimension? | [L2][CO4] | [8M] |
| 3 | a) | Briefly explain the mistake bound model for learning. | [L2][CO4] | [7M] |
| | b) | Explain Maximum Likelihood and Least Squared Error Hypotheses. | [L2][CO4] | [5M] |
| 4 | | Define the following | | |
| | a) | Naive Bayes classifiers | [L1][CO4] | [6M] |
| | b) | Gibbs algorithm | [L1][CO4] | [6M] |
| 5 | | Explain 'How To Apply Naive Bayes' Classifier On Text Data' | [L2][CO4] | [12M] |
| 6 | | Explain 'Naive Bayes Theorem with example'. | [L2][CO4] | [12M] |
| 7 | | Explain 'The concept of Probably Approximately Correct learning'. | [L2][CO4] | [12M] |
| 8 | | Clearly Explain "Minimum description length principle" | [L2][CO4] | [12M] |
| 9 | a) | Estimate conditional probabilities of each attributes {color, legs, height, smelly} for the species classes: {M, H} using the data given in the table. | [L2][CO4] | [6M] |
| | b) | Using these probabilities estimate the probability values for the new instance - (Color=Green, legs=2, Height=Tall, and Smelly=No). | [L2][CO4] | [6M] |

| No | Color | Legs | Height | Smelly | Species |
|----|-------|------|--------|--------|---------|
| 1 | White | 3 | Short | Yes | M |
| 2 | Green | 2 | Tall | No | M |
| 3 | Green | 3 | Short | Yes | M |
| 4 | White | 3 | Short | Yes | M |
| 5 | Green | 2 | Short | No | H |
| 6 | White | 2 | Tall | No | H |
| 7 | White | 2 | Tall | No | H |
| 8 | White | 2 | Short | Yes | H |

| 10 | Apply Naïve Bayes Classifier for the table below | [L2][CO4] | **[12M]** |
|----|--------------------------------------------------|-----------|-----------|

| Example No. | Color | Type | Origin | Stolen? |
|-------------|--------|--------|----------|---------|
| 1 | Red | Sports | Domestic | Yes |
| 2 | Red | Sports | Domestic | No |
| 3 | Red | Sports | Domestic | Yes |
| 4 | Yellow | Sports | Domestic | No |
| 5 | Yellow | Sports | Imported | Yes |
| 6 | Yellow | SUV | Imported | No |
| 7 | Yellow | SUV | Imported | Yes |
| 8 | Yellow | SUV | Domestic | No |
| 9 | Red | SUV | Imported | No |
| 10 | Red | Sports | Imported | Yes |

and decide whether the new car with attributes (Red, SUV, Domestic) can be stolen or not.

# UNIT –IV

## LINEAR MODELS FOR REGRESSION

| 1 | | Give a detail note on kernel methods? | [L1][CO6] | **[12M]** |
|---|---|---|---|---|
| 2 | a) | Explain the relationship between Linear regression and Machine Learning | [L2][CO6] | **[6M]** |
| | b) | The sales of a company (in million dollars) for each year are shown in the table below. <br> x (year)　　2005　2006　2007　2008　2009 <br> y (sales)　　12　　19　　29　　37　　45 <br><br> i) Find the least square regression line y = a x + b. <br> ii) Use the least squares regression line as a model to estimate the sales of the company in 2012. | [L2][CO6] | **[6M]** |
| 3 | | Compare classification with regression with an example | [L2][CO6] | **[6M]** |
| 4 | a) | List and explain features of Bayesian learning methods. | [L1][CO6] | **[10M]** |
| | b) | What are the drawbacks of Bayesian learning methods. | [L1][CO6] | **[2M]** |
| 5 | a) | What is a Linear Regression Model? | [L1][CO6] | **[6M]** |
| | b) | What are the different techniques to create a Linear Regression Model? | [L1][CO6] | **[6M]** |
| 6 | | What are Radial Basis Function Networks | [L1][CO6] | **[12M]** |
| 7 | a) | What is a Gaussian process? | [L1][CO6] | **[6M]** |
| | b) | What are the advantages and disadvantages of Gaussian Processes? | [L1][CO6] | **[6M]** |
| 8 | | Describe the Linear basis　function　models. | [L2][CO6] | **[12M]** |
| 9 | | Explain the　Bias-Variance decomposition | [L2][CO6] | **[12M]** |
| 10 | | Consider the following set of points: {(-2 , -1) , (1 , 1) , (3 , 2)} | | |
| | a) | Find the least square regression line for the given data points. | [L1][CO6] | **[6M]** |
| | b) | Plot the given points and the regression line in the same rectangular system　of axes. | [L1][CO6] | **[6M]** |

## UNIT –V

### APPROXIMATE INFERENCING

| 1 | | Define the following | | |
|---|---|---|---|---|
| | a) | Stochastic process | [L1][CO5] | **[6M]** |
| | b) | Bayes' theorem | [L2][CO5] | **[6M]** |
| 2 | | Define the following | | |
| | a) | Markov chain | [L1][CO5] | **[6M]** |
| | b) | Markov model | [L1][CO5] | **[6M]** |
| 3 | | Describe the following in details | | |
| | a) | Approximate inference methods | [L2][CO5] | **[4M]** |
| | b) | Bayesian inference method | [L2][CO5] | **[8M]** |
| 4 | | Explain the following | | |
| | a) | Linear regression | [L2][CO5] | **[6M]** |
| | b) | Logistic Regression | [L2][CO5] | **[6M]** |
| 5 | | Describe the following in detail | | |
| | a) | Reinforcement Learning | [L2][CO5] | **[4M]** |
| | b) | Q Learning | [L2][CO5] | **[4M]** |
| | c) | Temporal difference Learning | [L2][CO5] | **[4M]** |
| 6 | a) | What is Hidden Markov Model (HMM)? | [L1][CO5] | **[6M]** |
| | b) | Explain the components of a Hidden Markov Model (HMM | [L2][CO5] | **[6M]** |
| 7 | | Discuss any four real-world examples where the hidden Markov models are used. | [L2][CO5] | **[12M]** |
| 8 | | What is Viterbi algorithm and what is its purpose? Explain with an example. | [L1][CO5] | **[12M]** |
| 9 | | Explain "Linear Dynamical System ". | [L1][CO5] | **[12M]** |
| 10 | a) | What are Gaussian Mixture Models? | [L1][CO5] | **[6M]** |
| | b) | What are some real-world problems which can be solved using Gaussian mixture models? | [L1][CO5] | **[6M]** |

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