USN | | | | | | | | | | **10CS/IS764**

Seventh Semester B.E. Degree Examination, Dec.2016/Jan.2017
Artificial Intelligence

Time: 3 hrs.   Max. Marks:100

Note: *Answer any FIVE full questions, selecting*
atleast TWO questions from each part.

PART – A

1 a. Explain the properties of task environments with example.   **(10 Marks)**
   b. Explain the structure of a model based reflex agent with a diagram.   **(04 Marks)**
   c. Briefly explain the depth limited search and iterative deepening depth first search.
                                                                            (06 Marks)

2 a. State and prove the conditions that heuristic function h(n) should satisfy so that A^* search is both complete and optimal.   **(10 Marks)**
   b. Explain how backtracking search is used in solving constraint satisfaction problem with an example.   **(08 Marks)**
   c. Define a game as a kind of search problem.   **(02 Marks)**

3 a. Give the PEAS description of Wumpus world.   **(05 Marks)**
   b. Illustrate the procedure of converting the following sentence into conjunctive normal form.
      $$B_{1,1} \Leftrightarrow (P_{1,2} \vee P_{2,1})$$ **(06 Marks)**
   c. Write BNF grammar of sentences in propositional logic.   **(06 Marks)**
   d. Define equivalence, validity and satisfiability in logic.   **(03 Marks)**

4 a. Explain the knowledge engineering process for the domain of electronic circuits. [Refer Fig.Q4(a)]   **(10 Marks)**
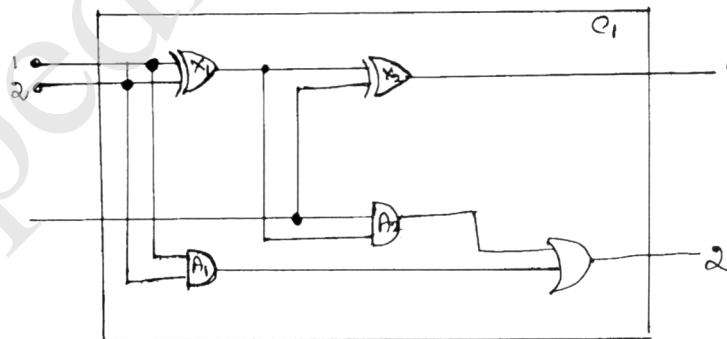

Fig.Q4(a)

   b. Explain the syntax of first order logic with equality, specified in BNF. Give example for each word.   **(10 Marks)**

PART – B

5 a. The law says that it is a crime for an American to sell weapons to hostile nations. The country Nano, an enemy of America, has some missiles and all of its missiles were sold to it by west, who is American. Prove that west is a criminal using resolution.   **(12 Marks)**

b. Determine the color of Fritz from the following knowledge base using (i) forward chaining (ii) backward chaining.
If x croaks and eats flies, then x is a frog. If x chirps and sings, then x is a canary. If x is a frog, then it is colored green if x is canary, then x is colored yellow. Fritz croaks and eats flies. **(08 Marks)**

6 a. Explain how categories and objects are represented and defined with suitable examples. **(06 Marks)**

b. What is situation calculus? Explain the ontology of situation calculus. **(06 Marks)**

c. Write short notes on : (i) Semantic networks (ii) Truth maintenance systems. **(08 Marks)**

7 a. The full joint distribution for three variables Toothache, cavity and catch are given below.

	Toothache		¬ Toothache	
	Catch	¬ Catch	Catch	¬ Catch
Cavity	0.108	0.012	0.072	0.008
¬ Cavity	0.016	0.064	0.144	0.576

Find (i)   P (cavity | toothache)
    (ii) P (toothache $\wedge$ catch | cavity)
    (iii) P (cavity) **(06 Marks)**

b. What is a Bayesian network? Explain the semantics of Bayesian network with an example. **(10 Marks)**

c. Write ADL description of simple spare fire problem. **(04 Marks)**

8 a. Write the decision tree learning algorithm with an example. **(10 Marks)**

b. Explain the issues affecting design of a learning element. **(10 Marks)**

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Fifth Semester B.E. Degree Examination, Dec.2018/Jan.2019
Artificial Intelligence

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1	a.	Define Artificial Intelligence and list the task domains of Artificial Intelligence. **(06 Marks)**
	b.	State and explain algorithm for Best First Search with an example. **(06 Marks)**
	c.	Explain production system. **(04 Marks)**

OR

2	a.	Write a note on Water Jug problem using production rules. **(08 Marks)**
	b.	Explain simulated annealing. **(04 Marks)**
	c.	Explain problem reduction with respect to AND-OR graphs. **(04 Marks)**

Module-2

3	a.	Explain the approaches to knowledge representation. **(10 Marks)**
	b.	Write a note on control knowledge. **(06 Marks)**

OR

4	a.	State the algorithm to Unify (L_1, L_2). **(06 Marks)**
	b.	Write the algorithm for conversion to clause form. **(10 Marks)**

Module-3

5	a.	Explain Justification based Truth Maintenance System (TMS) with an example. **(08 Marks)**
	b.	Write a note on Non-Monotonic logic and default logic. **(04 Marks)**
	c.	Explain abduction and inheritance. **(04 Marks)**

OR

6	a.	Write a note on Dempster Shafer theory. **(08 Marks)**
	b.	Define semantic network with an example. **(04 Marks)**
	c.	State Baye's theorem. **(04 Marks)**

Module-4

7	a.	Explain conceptual dependency along with its goals and representation. **(08 Marks)**
	b.	Give the reasons to build large databases. **(04 Marks)**
	c.	Write a note on iterative deepening. **(04 Marks)**

OR

8	a.	Write a note on global ontology. **(10 Marks)**
	b.	Explain Minimax search procedure. **(06 Marks)**

Module-5

9	a.	Define learning and give the difference between neural net learning and genetic learning. **(06 Marks)**
	b.	Write a note on Knowledge acquisition. **(06 Marks)**
	c.	Explain Rote learning. **(04 Marks)**

OR

10	a.	Explain the five phases of natural language processing. **(10 Marks)**
	b.	Explain spell checking techniques. **(06 Marks)**

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Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Artificial Intelligence

Time: 3 hrs.

Max. Marks: 100

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Explain the components and categories of production system. List the requirement of good control strategies. **(10 Marks)**

   b. Explain steepest Hill climbing technique with an algorithm. Comment on its drawbacks and how to overcome these drawbacks. **(10 Marks)**

OR

2 a. Consider trying to solve the 8-puzzle instance given below using Hill climbing. Apply any heuristic function appropriate to solve the problem. **(10 Marks)**

Start state

2	8	3
1		4
7	6	5

End state

1	2	3
8		4
7	6	5

   b. List and explain the problem characteristics which must be analyzed before deciding on a proper heuristic search. **(10 Marks)**

Module-2

3 a. Consider the following sentences:
   * John likes all kinds of food.
   * Apples are food.
   * Anything anyone eats and isn't killed by is food.
   * Bill eats peanuts and is still alive.
   * Sue eats everything Bill eats.

   (i) Translate all the sentences into formulas in predicate logic.
   (ii) Convert formulas from previous step into clause form.
   (iii) Prove that John likes peanuts using resolution. **(12 Marks)**

   b. Differentiate between forward and backward reasoning and list the factors that influences the choice between them. **(08 Marks)**

OR

4 a. Define CNF. Give an algorithm for converting given proposions to CNF. **(10 Marks)**

   b. Explain the different approaches used for knowledge representation and list the qualities a good knowledge representation system should possess. **(10 Marks)**

Module-3

5 a. Explain Justification based Truth Maintenance System (JTMS). What are the two critical criterion that must be met during labeling of JTMS and illustrate with suitable example. **(10 Marks)**

   b. What are portioned semantic nets? Express the following quantified expression using semantic nets:
   (i) Every dog has bitten a mail carrier.
   (ii) Every dog in town has bitten the constable. **(10 Marks)**

OR

6 a. What are the key issues in non-monotonic reasoning system? Explain the two approaches used for logic representation for non-monotonic reasoning. **(10 Marks)**

   b. Define Bayes theorem. What are its limitations? How certainty factor is used to overcome its limitation? **(10 Marks)**

Module-4

7 a. Explain the conceptual dependency representation of an event or action. **(10 Marks)**

   b. Explain MINMAX search with appropriate algorithm. **(10 Marks)**

OR

8 a. What is global ontology? What are the distinctions provided by Global ontology for defining a 'thing'? **(10 Marks)**

   b. What are scripts? Explain the important components of a script with an example. **(10 Marks)**

Module-5

9 a. Explain the usage of Soundex Algorithm for phonetic based spell checking with suitable example. **(10 Marks)**

   b. Write a note on knowledge acquisition. **(10 Marks)**

OR

10 a. List and explain the steps involved in natural language processing. **(10 Marks)**

   b. What is Analogy based learning? Differentiate between transformations analogy and derivational analogy. **(10 Marks)**

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Fifth Semester B.E. Degree Examination, June/July 2019
Artificial Intelligence

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. What is AI technique? List less desirable properties and representation of knowledge.
(08 Marks)

   b. Explain production system with components and characteristics. List the requirement of good control strategies. **(08 Marks)**

OR

2 a. List and explain the AI problem characteristics. **(08 Marks)**
   b. Explain constraint satisfaction and solve the cryptarithmetic problem :
   CROSS + ROADS = DANGER. **(08 Marks)**

Module-2

3 a. List and explain the issues in knowledge Representation. **(08 Marks)**
   b. State and explain the algorithm to convert predicates to clausal form. **(08 Marks)**

OR

4 a. Consider the following predicates
      i)   Man (Marcus)
      ii)   Pompeian (Marcus)
      iii) born (Marcus, 40)
      iv) $\forall x$; man (x) $\rightarrow$ mortal (x)
      v) $\forall x$: Pompeian (x) $\rightarrow$ died (x, 79)
      vi)   erupted (volcano, 79)
      vii) $\forall x : \forall t_1 : \forall t_2 :$ mortal (x) $\wedge$ born (x, t_1) $\wedge$ gt(t_2-t_1, 150) $\rightarrow$ dead (x, t_2)
      viii) now = 1991
      ix) $\forall x : \forall t : [alive(x, t) \rightarrow \sim dead (x, t)] \wedge [\sim dead(x, t) \rightarrow alive(x, t)$
      x) $\forall x : \forall t_1 : \forall t_2 :$ died (x, t_1) $\wedge$ gt (t_2, t_1) $\rightarrow$ dead (x, t_2)
   Prove that : $\sim$ alive (Marcus, now) **(10 Marks)**
   b. What is matching in rule based system? briefly explain the different proposals for matching.
(06 Marks)

Module-3

5 a. What is non monotonic reasoning? Explain the logics and approaches for non monotonic reasoning. **(08 Marks)**
   b. Why truth maintenance systems are required? Explain different types truth maintenance systems. **(08 Marks)**

OR

6 a. Explain Dempster – Shafer theory with example. **(08 Marks)**
   b. Define semantic net. Represent the following sentence using partitioned semantic net :
      i)   Every dog in town has bitten the constable
      ii)   Every dog has bitten every mail carrier. **(08 Marks)**

Module-4

7 a. Define conceptual dependency. List goals and primitive acts with meaning. **(08 Marks)**
   b. Explain the scripts with components. Write the script for the Restaurant. **(08 Marks)**

OR

8 a. State and explain the MINIMAX algorithm with example. **(08 Marks)**
   b. Explain iterative deepening. Write algorithms for Depth First iterative depending and Iterative deepening A^*. **(08 Marks)**

Module-5

9 a. What is Natural language processing? Explain the steps in process. **(08 Marks)**
   b. Explain the spell checking with different techniques. **(08 Marks)**

OR

10 a. What is learning? Explain the Winston's learning program with example. **(08 Marks)**
   b. Explain the expert system and knowledge acquisition process, with example. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, Dec.2018/Jan.2019
Machine Learning

Time: 3 hrs.   Max. Marks: 80

Note: *Answer FIVE full questions, choosing ONE full question from each module.*

Module-1

1   a.   Specify the learning task for 'A checkers learning problem'.   **(03 Marks)**
    b.   Discuss the following with respect to the above,
         (i)   Choosing the training experience.
         (ii)   Choosing the target function and
         (iii)   Choosing a function approximation algorithm.   **(09 Marks)**
    c.   Comment on the issues in machine learning.   **(04 Marks)**

OR

2   a.   Write candidate elimination algorithm. Apply the algorithm to obtain the final version space for the training example.   **(10 Marks)**

Sl. No.	Sky	Air temp	Humidity	Wind	Water	Forecast	Enjoy sport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Cool	Change	Yes

    b.   Discuss about an unbiased Learner.   **(06 Marks)**

Module-2

3   a.   What is a decision tree & discuss the use of decision tree for classification purpose with an example.   **(08 Marks)**
    b.   Write and explain decision tree for the following transactions: **(08 Marks)**

Tid	Refund	Martial status	Taxable Income	Cheat
1	Yes	Single	125 K	No
2	No	Married	100 K	No
3	No	Single	70 K	No
4	Yes	Married	120 K	No
5	No	Divorced	95 K	Yes
6	No	Married	60 K	No
7	Yes	Divorced	220 K	No
8	No	Single	85 K	Yes
9	No	Married	75 K	No
10	No	Single	90 K	Yes

OR

4   a.   For the transactions shown in the table compute the following :
         (i)   Entropy of the collection of transaction records of the table with respect to classification.
         (ii) What are the information gain of a_1 and a_2 relative to the transactions of the table?
                                                                                         (08 Marks)

Instance	1	2	3	4	5	6	7	8	9
a_1	T	T	T	F	F	F	F	T	F
a_2	T	T	F	F	T	T	F	F	T
Target class	+	+	–	+	–	–	–	+	–

    b.   Discuss the decision learning algorithm.   **(04 Marks)**
    c.   List the issues of decision tree learning.   **(04 Marks)**

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Module-3

5 a. Draw the perceptron network with the notation. Derive an equation of gradient descent rule to minimize the error. **(08 Marks)**

   b. Explain the importance of the terms : (i) Hidden layer (ii) Generalization (iii) Overfitting (iv) Stopping criterion **(08 Marks)**

OR

6 a. Discuss the application of Neural network which is used for learning to steer an autonomous vehicle. **(06 Marks)**

   b. Write an algorithm for back propagation algorithm which uses stochastic gradient descent method. Comment on the effect of adding momentum to the network. **(10 Marks)**

Module-4

7 a. What is Bayes theorem and maximum posterior hypothesis? **(04 Marks)**

   b. Derive an equation for MAP hypothesis using Bayes theorem. **(04 Marks)**

   c. 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 teams 1's football field. On the otherhand, 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? **(08 Marks)**

OR

8 a. Describe Brute-force MAP learning algorithm. **(04 Marks)**

   b. Discuss the Naïve Bayees classifier. **(04 Marks)**

   c. The following table gives data set about stolen vehicles. Using Naïve bayes classifier classify the new data (Red, SUV, Domestic) **(08 Marks)**

Table

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
Yellow	SUV	Imported	Yes
Yellow	SUV	Domestic	No
Red	SUV	Imported	No
Red	Sports	Imported	Yes

Module-5

9 a. Write short notes on the following:
   (i)   Estimating Hypothesis accuracy.
   (ii)   Binomial distribution. **(08 Marks)**

   b. Discuss the method of comparing two algorithms. Justify with paired to tests method. **(08 Marks)**

OR

10 a. Discuss the K-nearest neighbor language. **(04 Marks)**

    b. Discuss locally weighted Regression. **(04 Marks)**

    c. Discuss the learning tasks and Q learning in the context of reinforcement learning. **(08 Marks)**

15CS73

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020
Machine Learning

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   What do you mean by well-posed learning problem? Explain with example. **(04 Marks)**
    b.   Explain the various stages involved in designing a learning system in brief. **(08 Marks)**
    c.   Write Find_S algorithm and discuss the issues with the algorithm. **(04 Marks)**

OR

2   a.   List the issues in machine learning. **(04 Marks)**
    b.   Consider the given below training example which finds malignant tumors from MRI scans.

Example	Shape	Size	Color	Surface	Thickness	Target concept
1	Circular	Large	Light	Smooth	Thick	Malignant
2	Circular	Large	Light	Irregular	Thick	Malignant
3	Oval	Large	Dark	Smooth	Thin	Benign
4	Oval	Large	Light	Irregular	Thick	Malignant
5	Circular	Small	Light	Smooth	Thick	Benign

Show the specific and general boundaries of the version space after applying candidate elimination algorithm. (Note: Malignant is +ve, Benign is −ve). **(08 Marks)**
    c.   Explain the concept of inductive bias in brief. **(04 Marks)**

Module-2

3   a.   Discuss the two approaches to prevent over fitting the data. **(08 Marks)**
    b.   Consider the following set of training examples:

Instance	Classification	a_1	a_2
1	1	1	1
2	1	1	1
3	0	1	0
4	1	0	0
5	0	0	1
6	0	0	1

(i)   What is the entropy of this collection of training examples with respect to the target function classification?
(ii) What is the information gain of a_2 relative to these training examples? **(08 Marks)**

OR

4   a.   Define decision tree. Construct the decision tree to represent the following Boolean functions:
    i) A ∧¬B   ii) A ∨ [B ∧ C]   iii) A XOR B   **(06 Marks)**
    b.   Write the ID3 algorithm. **(06 Marks)**
    c.   What do you mean by gain and entropy? How it is used to build the decision tree. **(04 Marks)**

Module-3

5 a. Define perceptron. Explain the concept of single perceptron with neat diagram. **(06 Marks)**

    b. Explain the back propagation algorithm. Why is it not likely to be trapped in local minima? **(10 Marks)**

OR

6 a. List the appropriate problems for neural network learning. **(04 Marks)**

    b. Discuss the perceptron training rule and delta rule that solves the learning problem of perceptron. **(08 Marks)**

    c. Write a remark on representation of feed forward networks. **(04 Marks)**

Module-4

7 a. Explain Naïve Bayes classifier. **(08 Marks)**

    b. Explain brute force MAP learning algorithm. **(08 Marks)**

OR

8 a. Discuss Minimum Description Length principle in brief. **(08 Marks)**

    b. Explain Bayesian belief networks and conditional independence with example. **(08 Marks)**

Module-5

9 a. Define: (i) Simple Error   (ii) True Error **(04 Marks)**

    b. Explain K-nearest neighbor learning algorithm. **(08 Marks)**

    c. What is reinforcement learning? **(04 Marks)**

OR

10 a. Define expected value, variance, standard deviation and estimate bias of a random variable. **(04 Marks)**

    b. Explain locally weighted linear regression. **(08 Marks)**

    c. Write a note on Q-learning. **(04 Marks)**

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Seventh Semester B.E. Degree Examination, June/July 2019
Machine Learning

Time: 3 hrs.

Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   Define machine learning. Describe the steps in designing learning system.   **(08 Marks)**

     b.   Write Find-S algorithm and explain with example.   **(04 Marks)**

     c.   Explain List-Then-Eliminate algorithm.   **(04 Marks)**

OR

2   a.   List out any 5 applications of machine learning.   **(05 Marks)**

     b.   What do you mean by hypothesis space, instance space and version space?   **(03 Marks)**

     c.   Find the maximally general hypothesis and maximally specific hypothesis for the training examples given in the table using candidate elimination algorithm.   **(08 Marks)**

Day	Sky	Air Temp	Humidity	Wind	Water	Forecast	Enjoy Sport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Cold	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Cool	Change	Yes

Module-2

3   Construct decision tree for the following data using ID3 algorithm.

Day	A1	A2	A3	Classification
1	True	Hot	High	No
2	True	Hot	High	No
3	False	Hot	High	Yes
4	False	Cool	Normal	Yes
5	False	Cool	Normal	Yes
6	True	Cool	High	No
7	True	Hot	High	No
8	True	Hot	Normal	Yes
9	False	Cool	Normal	Yes
10	False	Cool	High	No

(16 Marks)

OR

4   a.   Explain the concept of decision tree learning. Discuss the necessary measure required to select the attributes for building a decision tree using ID3 algorithm.   **(08 Marks)**

     b.   Discuss the issues of avoiding over fitting the data, handling continuous data and missing values in decision trees.   **(08 Marks)**

Module-3

5   a.   Explain artificial neural network based on perception concept with diagram.   **(06 Marks)**

     b.   What is gradient descent and delta rule? Why stochastic approximation to gradient descent is needed?   **(04 Marks)**

     c.   Describe the multilayer neural network. Explain why back propagation algorithm is required.   **(06 Marks)**

OR

6 a. Derive the back propagation rule considering the output layer and training rule for output unit weights. **(08 Marks)**
   b. What is squashing function 3 why is it needed? **(04 Marks)**
   c. List out and explain in briefly representation power of feed forward networks. **(04 Marks)**

Module-4

7 a. Explain maximum a posteriori (MAP) hypothesis using Bayes theorem. **(06 Marks)**
   b. Estimate conditional probabilities of each attributes {colour, legs, height, smelly} for the species classes: {M, H} using the data given in the table. Using these probabilities estimate the probability values for the new instance – (Colour = Green, Legs = 2, Height = Tall and Smelly = No) **(10 Marks)**

No	Colour	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

OR

8 a. Explain Naive Bayes classifier and Bayseian belief networks. **(10 Marks)**
   b. Prove that how maximum likelihood (Bayesian learning) can be used in any learning algorithms that are used to minimize the squared error between actual output hypothesis and predicted output hypothesis. **(06 Marks)**

Module-5

9 a. Explain locally weighted linear regression. **(08 Marks)**
   b. What do you mean by reinforcement learning? How reinforcement learning problem differs from other function approximation tasks. **(05 Marks)**
   c. Write down Q-learning algorithm. **(03 Marks)**

OR

10 a. What is instance based learning? Explain K-Nearest neighbour algorithm. **(08 Marks)**
    b. Explain sample error, true error, confidence intervals and Q-learning function. **(08 Marks)**

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Seventh Semester B.E. Degree Examination, Aug./Sept.2020
Machine Learning

Time: 3 hrs.   Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1   a.   What is Machine Learning? Explain different perspectives and issues in machine learning.
                                                                                               (06 Marks)
     b.   Explain the steps in designing a learning system.   **(10 Marks)**

OR

2   a.   Describe the Candidate-Elimination algorithm. Explain its working, taking the enjoy sport concept and training instances given below:

Example	Sky	Air Temp	Humidity	Wind	Water	Forecast	Enjoy sport
1	Sunny	Warm	Normal	Strong	Warm	Same	Yes
2	Sunny	Warm	High	Strong	Warm	Same	Yes
3	Rainy	Clod	High	Strong	Warm	Change	No
4	Sunny	Warm	High	Strong	Warm	Change	Yes

                                                                                               (10 Marks)
     b.   Explain how to model inductive systems by their equivalent deductive systems for Candidate-Elimination Algorithm.   **(06 Marks)**

Module-2

3   a.   Explain the concepts of entropy and information gain.   **(06 Marks)**
     b.   Describe the ID3 algorithm for decision tree learning.   **(10 Marks)**

OR

4   a.   Apply ID3 algorithm for constructing decision tree for the following training example.

Day	Outlook	Temperature	Humidity	Wind	Play Tennis
D1	Sunny	Hot	High	Weak	No
D2	Sunny	Hot	High	Strong	No
D3	Overcast	Hot	High	Weak	Yes
D4	Rain	Mild	High	Weak	Yes
D5	Rain	Cool	Normal	Weak	Yes
D6	Rain	Cool	Normal	Strong	No
D7	Overcast	Cool	Normal	Strong	Yes
D8	Sunny	Mild	High	Weak	No
D9	Sunny	Cool	Normal	Weak	Yes
D10	Rain	Mild	Normal	Weak	Yes
D11	Sunny	Mild	Normal	Strong	Yes
D12	Overcast	Mild	High	Strong	Yes
D13	Overcast	Hot	Normal	Weak	Yes
D14	Rain	Mild	High	Strong	No

                                                                                               (10 Marks)
     b.   Explain the issues in decision tree learning.   **(06 Marks)**

Module-3

5 a. Explain appropriate problems for Neural Network Learning with its characteristics.

   (10 Marks)

   b. Explain the single perceptron with its learning algorithm.   (06 Marks)

OR

6 a. Explain Back Propagation algorithm.   (10 Marks)
   b. Explain the remarks of Back propagation algorithm.   (06 Marks)

Module-4

7 a. Explain Naïve Bayes classifier.   (10 Marks)
   b. Explain Bayesian Belief Networks.   (06 Marks)

OR

8 a. Explain EM algorithm.   (08 Marks)
   b. Explain the derivation of K-means algorithm.   (08 Marks)

Module-5

9 a. Explain K-nearest neighbor learning algorithm with example.   (10 Marks)
   b. Explain case based reasoning with example.   (06 Marks)

OR

10   Write short note on:
   a. Q learning
   b. Radial basis function
   c. Locally weighted regression
   d. Sampling theory.   (16 Marks)