

## IT 8061 COMPUTATIONAL INTELLIGENCE

### IMPORTANT QUESTIONS AND QUESTION BANK

#### UNIT-5 INTELLIGENCE AND APPLICATIONS

##### 2-Marks

1. Define CFG.?
2. State Morphology?
3. Label the terminologies are available in NLP?
4. List out the advantages of NLP?
5. Give the merits and demerits of context free grammars?
6. Identify the components of Natural language processing?
7. Infer parse tree and give example?
8. Show how would you differentiate Machine Translation and Learning?
9. Differentiate syntax and semantic analysis in NLP terminologies?
10. Write about symbol based application in intelligence?

##### Part-B

1. List the Steps in Natural Language Processing and explain them with some examples. (13)
2. Describe the categories involved in Information Retrieval system. (13)
3. Describe about NLP? Write in details about various application of NLP. (13)
4. Express the basic concept of Machine Translation System with a schematic diagram. (13)
5. Discuss the concept of Computer Intelligence and its application. (13)
6. i. Illustrate probabilistic models for information extraction (7)  
ii. Express conditional random fields for information extraction (6)
7. Identify about the application of natural language processing. (13)
8. Evaluate whether an IR system is performing well? (13)
9. Point out the importance of syntax and semantics in NLP. Construct a grammar and draw the parse tree for the sentence "Bill Printed the file". (15)
10. Case study: Find the algorithm that is capable of learning to recognize the handwritten digits and squeezing every last drop of predictive performance out of them. (15)
11. What is Natural language processing? Mention its application domain in AI. What are some of the problems which arise in natural language

understanding for autonomous machines like robots, intelligent computers.

(15)

12. Analyze the structure and research models involved in machine translation.

(15)

13. Compare the machine learning and machine translation application of NLP?

14. Write a short notes on (i) phonology (ii) morphology (iii) discourse (iv) semantics

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#### UNIT-1 INTRODUCTION

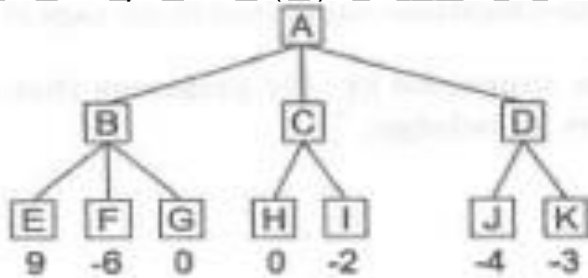
##### 2-Marks

1. Define Artificial Intelligence.
2. Describe the four categories under which AI is classified?
3. What are Expert Systems?
4. List the characteristic features of expert system?
5. Define Inference.
6. Give the components of Game software?
7. Write the general form of the genetic algorithm?
8. Show the definition of state-space search technique?
9. Compare Informed & Uninformed search with examples?
10. State the Point of view of alpha-beta pruning?

##### Part-B

1. Describe informed search strategies with an example?
2. List the advantages and limitations of Genetic Algorithm. State the taxonomy of the crossover operator
3. Define A\* search algorithm. Discuss about the admissibility of A\* algorithm. (13)
4. List and describe the problem characteristics that need to be considered for selecting appropriate heuristics for a given class of problems. (13)
5. (i) Distinguish A\* and AO\* algorithm with each other. (6)  
(ii) Demonstrate why some times unnecessary backward propagation occurs in AND OR graph. (7)
6. Infer in details about Rule Based Systems with some examples. (13)
7. (i). Give the characteristics of AI problems? Explain with example (7)  
(ii). Express what is Control Strategy and Production System? How this is helpful in AI (6)
8. Write short notes on Expert system tools and expert system shell. (13)
9. How is AI useful in game playing techniques. Describe what is adversarial search? (13)
10. (i). Illustrate the role of knowledge engineer, domain expert and an end user in an expert system. (6)  
(ii). Explain the difficulties involved in developing an expert system. (7)

11. Point out the procedures of genetic algorithms and what are the different genetic representations
12. (i) Infer what is alpha beta pruning / search. (7)  
(ii) Explain MINIMAX search technique / algorithm with an example (6)
13. Draw the state space graph of Hill climbing search. What are the draw backs of this algorithm? Also discuss about time space complexity of algorithm
14. Solve the given problem. Describe the operators involved in it. Consider a Water jug Problem: You are given two jugs, a 4-gallon one and a 3-gallon one. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 gallons of water into the 4-gallon jug? Explicit Assumptions: A jug can be filled from the pump, water can be poured out of a jug onto the ground, water can be poured from one jug to another and that there are no other measuring devices available. (15)
15. Consider a two player game in which the minimax search procedure is used to compute the best moves for the first player. Assume a static evaluation function that returns values ranging from -10 to 10, with 10 indicating a win for the first player and -10 a win for the second player. Assume the following game tree in which the static scores are from the first player 's point of view. Suppose the first player is the maximizing player and needs to make the next move. What move should be chosen at this point? Can the search be optimized? (15)



## UNIT-2 KNOWLEDGE REPRESENTATION AND REASONING

### 2-Marks

1. Identify how predicate logic is helpful in knowledge representation?
2. Define unification?
3. List the predicates of time intervals?
4. Give the expansion of LISP and PROLOG?
5. State in your own words about uniqueness quantifier?

6. Differentiate propositional logic and predicate logic?
7. Differentiate declarative and procedural knowledge?
8. Show what is the problem that the effect of axiom say?
9. Analyze the following in a predicate logic: For all x and y, if x is a parent of y then y is a child of x ?
10. For the given sentence "All Pompeian's were Romans" write a well formed formula in predicate logic?

### Part-B

1. Describe briefly about Ontological Engineering
2. Define the term logic. What is the role of logic in Artificial Intelligence?  
Compare Propositional logic with First order logic (Predicate Calculus). (13)
3. Describe Unification algorithm in brief with an example. (13)
4. Infer the ontology for situation calculus.(13)
5. Explain how categories and objects are presented in any four sets. (13)
6. Explain Backward and forward Chaining , with example in logic representation. Also mention advantages and disadvantages of both the algorithms. (13)
7. Explain briefly about the characteristics of a prolog programming. (13)
8. How is resolution in first order predicate logic different from that of propositional performed? What is Unification Algorithm & why it is required?
9. Trace the operations of the unification algorithm on each of the following pairs of literals:
  - (i)  $f(\text{Marcus})$  and  $f(\text{Caesar})$  (3)
  - (ii)  $f(x)$  and  $f(g(y))$  (5)
  - (iii)  $f(\text{Marcus}, g(x,y))$  and  $f(x, g(\text{Caesar}, \text{Marcus}))$  (5)
10. Consider the following sentences:
  - . John likes all kinds of food
  - . Apples are food
  - . Chicken is 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 these sentences into formulas in predicate logic(7)
  - (ii) Convert the formulas of part a into clause form (5)
11.
  - (i). Why we use prolog programming language? (5)
  - (ii) Write a sample program in prolog language?(6)
  - (iii) Criticize how prolog language can be stated as procedural language
12. Evaluate the unification algorithm used for reasoning under predicate logic with an example. Consider the following factsa.

- a) Team india
- b) Team Australia
- c) Final match between India and Australia by resolution
- d) India scored 350 runs Australia scored 350 runs india lost 5 wickets  
Australia lost 7 wickets
- e) The team which scored the maximum runs wins
- f) If the scores are same the team which lost minimum wickets wins the match

Represent the facts in predicate, convert to clause form and prove wins the match?

### **UNIT-3 UNCERTAINTY**

#### **2-Marks**

1. Define Neural Networks
2. What is Fuzzy Logic? What is its use?
3. Define non monotonic reasoning
4. List the Application of neural networks
5. What are the ways in which one can understand the semantics of a belief network?
6. What are the two functions in Neural network's Activation functions?
7. State in your own words about Hedges?
8. Generalize single layer and multilayer feed forward neural network?
9. Produce the main difficulties involved with the gradient descent method?
10. What happens if the examples are not linearly separable?

#### **Part-B**

1. Define Fuzzy Set? Explain in brief about Fuzzy set operation? (13)
2. Identify the different key issues with respect to non-monotonic reasoning system? (13)
3. Describe briefly about the neuro fuzzy inference in detail. (13)
4. Classify the fuzzy rules with examples. (13)
5. Demonstrate fuzzy inferences from imprecise data. (13)
6. Write a note on fuzzy logic. How do it uses for probabilistic reasoning. (13)
7. Explain in brief about fuzzy propositions? (13)
8. Point out the type of problems that can be solved with neural network? What are the advantages? What are the inconvenient?

9. Write the most popular algorithm for training a neural network? What is its principle? (13)
10. Assess the conventional reasoning system with non-conventional reasoning system? (15)
11. With the help of diagram, explain the training algorithm of Back propagation networks and discuss how the various parameters are chosen for training the neural net? (15)
12. Explain the neuro fuzzy architecture and give some applications.(15)
13. Explain fuzzy logic control with the neat diagram. (15)
14. Distinguish between single layer and multi layer perception neural networks?
15. Identify the list of basic structure of a generic temporal models?

### **UNIT-4 LEARNING**

#### **2-Marks**

1. Define Bayes theorem. Give the Baye's rule equation?
2. What is localization problem?
3. Mention the statistical learning methods?
4. What is HMM?
5. Infer what is Reward Function in Reinforcement learning?
6. Give the different forms of learning?
7. State the support vector in SVM?
8. Generalize the categories of neural network structures?
9. Identify the issues that affect the design of an learning element?
10. Write some applications of Supervised Learning?

#### **Part-B**

1. Describe Hidden Markov Model and its applications in AI. (13)
2. Define EM algorithm and explain the general form of EM algorithm. (13)
3. Describe briefly about the Regression and Classification with Linear Models. (13)
4. Identify Various Types of Reinforcement Learning Techniques. (13)
5. Distinguish between Supervised Learning and Unsupervised Learning. Also mention some of the application areas of both. (13)
6. Express the statistical Learning with examples. (13)

7. Describe briefly about (i) Continuous model for Maximum likelihood Estimation (ii) Learning with Hidden Variables?
8. Marie's marriage is tomorrow
- In recent years , each year it has rained only 5 days
  - The weatherman has predicted rain tomorrow
  - When it actually rains the weatherman correctly forecasts rain 90% of
- What is the probability that it will rain on the day of Marie's wedding? (13)
9. Generalize Support Vector Machines in detail. What are advantages and disadvantages of SVM. (13)
10. Tell briefly about the Decision Tree Learning? Why it is useful in AI applications? (13)
11. What is learning with complete data? Explain Maximum Likelihood Parameter Learning with Discrete Model in detail. (13)
12. Can linear regression be used for classification? Justify. (13)
13. What is the maximum number of edges in a Bayesian network (BN) with  $n$  nodes? Prove that a valid BN containing this number of edges can be constructed (remember that the structure of a BN has to be a Directed Acyclic Graph). (13)
14. Construct the Bayesian network and define the necessary CPTs for the given scenario we have a bag of three biased coins a, b and c with probabilities of coming up heads of 20%, 60% and 80% respectively. One coin is drawn randomly from the bag (with equal likelihood of drawing each of the three coins) and then the coin is flipped three times to generate the outcomes  $X_1$ ,  $X_2$  and  $X_3$ ?
15. Consider the following data provided for Weather Forecasting Scenario.
- Two states (Hidden) : 'Low' and 'High' atmospheric pressure. Two observations (Visible States) : 'Rain' and 'Dry'?

