

# Artificial Intelligence

## Question Bank (2007-2013)

### Set 1

- 1) Define “Intelligence” and “AI”. Now-a-day, we are addicted to AI devices and we can’t imagine a single day without the use of these devices. Moreover, AI devices changed our everyday life style. Do you agree or disagree with this statement? Justify your opinion with relevant examples or your own logic. ’13 ’12 ’07
- 2) How AI does differ from human intelligence? What are the negative effects of AI on human society? ’13
- 3) Define in your own words each of the following terms: Agent and Rationality. ’13 ’12 Rational Agent, Performance measurers. ’08 For each of the following agents develop a PEAS description of the task environment: (Internet book shopping agent, Medical diagnosis system, Interactive English tutor) ’13 (Robot Soccer Player, Internet book shopping agent) ’12
- 4) Iterative deepening is a popular uninformed search method. Why? Show that the number of nodes generated to find a goal state is larger in both when using DFS and BFS than that of IDS. ’13 ’12
- 5) Write the advantages and disadvantages of acting rationally. ’11
- 6) What are the differences between omniscient agent and rational agent? ’11
- 7) Briefly describe the environment type of ‘chess without a clock’ and explain which type of agent will work best in this environment. ’11
- 8) Write short notes on: Goal based agents, Utility based agents, Agent environments, Model based reflex agent, Dynamic environment. ’09 ’11
- 9) What is AI? “Surely computers cannot be intelligent-they can only do what their programmers tell them”. Is the later statement true and does it imply the former? ’10 ’08
- 10) What do you mean by productions systems and control strategies? Briefly discuss the classification of production systems? ’10 ’09
- 11) What is heuristic function? ’07 What is the purpose of it? ’13 ’12 Write down the procedure to solve traveling salesman problem using “nearest neighbor heuristic” technique. ’10 ’09 How a heuristic search does play an important role in solving AI problem? ’07
- 12) What do you mean by AI & AI technique? Write a short note on Physical Symbol System Hypothesis. ’09
- 13) What are the steps need to be followed for building a system to solve a particular problem? ’09
- 14) What is the purpose of study AI in the field of CSE? ’08
- 15) How agents interact with the Environment? Percept sequence and action of a simple agent function for the Vacuum-cleaner world? ’08
- 16) Differentiate between knowledge, belief, hypothesis and data. Write various task domains of AI with examples. ’07 ’10
- 17) Water-Jug problem. ’07

## Set 2

- 1) Draw the architecture for the following agents: Reflect agent, Model based agent, Goal based agent, Learning agent. '13
- 2) Difference between BFS, DFS & IDS in term of four evaluation criteria of an algorithm. '13 '12
- 3) Difference between uninformed and informed search. '13 '12 List two examples of each type of algorithm. '12
- 4) Write down gradient search algorithm. Illustrate the several problems which are faced in the gradient search algorithm. Explain to deal with the problems. '07 '10 '12
- 5) Define contingency and sensor less problem. '11
- 6) "In Best First Search the desired path from one node to another was always the one with the lowest cost but this is not always case when search on AND-OR graph"-Justify the statement with proper example. '07 '10 '11 '12 '13
- 7) Write down the A\* algorithm. '10 Proof the optimality of A\* search. '11
- 8) Draw the problem tree that will be generated by the process of problem decomposition when you want to solve the problem of computing the expression  $\int (x^2 + 3x + \sin^2 x \cos^2 x) dx$ . '10
- 9) Write down the algorithm for steepest-ascent hill climbing. In what situations steepest-ascent hill climbing may fail to find a solution? How will you overcome such situations? '09 Briefly describe Hill climbing search. '11
- 10) Write down the A\* algorithm to find the best path from a source node to a destination node. Consider the figures below. '09 (Figure: Slide Lecture4.pptx (47)) + Greedy BFS + Which problem is suitable in practice for solving route-finding problems? '12 '13
- 11) Explain the concept of uniform cost search. Also show the progression of the search in the state space shown below using uniform cost search to find best route from S to G. [Figure: Question] '08
- 12) What do you mean by greedy search? What are the disadvantages of greedy search? Propose a technique with its working principle that will overcome the limitations of greedy search. '08
- 13) Write down the algorithm for simulated annealing. What is the difference between simulated annealing and hill climbing? '08
- 14) BFS related graph problem: See question '07 '12

### Set 3

1) Problem on 8 puzzles to solve using hill climbing. Can a heuristic function be found to make this work? Table on question: '13

2) Consider the following game tree and assume that the first player is the maximizing player. Which move should the first player choose? Figure: Question '13

3) What do you mean by entailment in propositional logic? '11

4) **Consider the sentences:** a) John likes all kinds of food, b) Apples are food, c) Chicken is food, d) Anything anyone eats and isn't killed by is food, e) Bill eats peanuts and still alive, f) Sue eats everything Bill eats. i) Translate these sentences into formulas in predicate logic. ii) Prove that John likes peanuts using resolution. '11

**Consider the sentences:** a) Nazrul was a poet, b) Nazrul is a national poet, c) All poet are romantic, d) CUET is an engineering university, e) All Bangladeshi were either love Nazrul or forgot him, f) Everyone is to love someone, g) All poets are human i) Translate these sentences into formulas in predicate logic. ii) Using the facts a) and g), answer the following question, "Did Bangladeshi like Nazrul?" '12 '13

**Consider the sentences:** a) Rahim only likes easy courses. b) Engineering courses are hard. c) All the courses in the CSE department are easy. d) CSE-345 is a CSE course. Use resolution algorithm to answer the question, "What courses would Rahim like?" '12 '13

**Consider the sentences:** a) Jack owns a dog. b) Every dog owner is an animal lover. c) No animal lover kills an animal. d) Either Jack or Curiosity killed the cat, who is named Tuna. Convert into first order logic using resolution algorithm to answer whether the statement, "Curiosity killed Tuna" is True or False. '08

5) A doctor knows that pneumonia causes a fever 95% of the time. She knows that if a person is selected randomly from the pneumonia. 1 in 100 people suffer from fever. You can go to the doctor complaining about the symptom of having a fever (evidence). What is the probability that pneumonia is the cause of this symptom? '11

6) Write down the advantages and disadvantages of BFS and DFS. '10

7) Write down the constraint satisfaction algorithm. Also explain how you will use this algorithm to solve crypto arithmetic problems. '09

8) Explain inheritable knowledge with the help of property inheritance algorithm. '09

9) Explain several issues in knowledge representation. '09

10) Explain "Problem formulation must follow goal formulation". '08

11) Write tree search algorithm. '09 Give an example of tree search. Write down search strategies. '08

12) Write down difference between iterative depending search and depth limited search. '08 '11

13) Prove that Uniform cost search and "Breath first search" with constant step cost are optimal when used the "Graph Search" algorithm. Show a state space with constant step cost in which "Graph Search" using iterative depending finds a sub optimal solution. '08

14) Prove that if  $h$  rarely overestimates  $h$  by more than  $\delta$ , then  $A^*$  algorithm will be rarely find a solution where cost is more than  $\delta$  greater than the cost of the optimal solution. '07

15) Mention the application of crypto-arithmetic algorithm. Trace the constraint satisfaction procedure solving the following crypto arithmetic problem:

i) CROSS '07 '11 ii) SEND '13 '12 '10 iii) TWO Also check figure on question paper. '08

<u>+ROADS</u>	<u>+MORE</u>	<u>+TWO</u>
DANGER	MONEY	FOUR

## Set 4

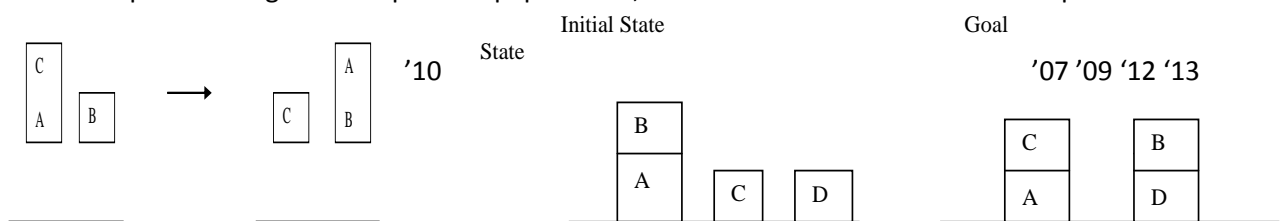
- 1) Distinguish between propositional logic and predicate logic. '12
- 2) What is planning? Using Regression planning algorithm show all the necessary steps to reach from initial step to goal state. Figure on question. '11 What are the components of a planning system? '10 '11
- 3) Differences between shallow parsing and full parsing. What is meant by heuristic search? '11
- 4) Suppose you are given two jugs a 4-gallon one and a 3-gallon one. Neither have 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? '10
- 5) Convert the following statement into first order logic: "Everybody loves somebody". '10
- 6) Write down the minimax algorithm to determine the optimal strategy for Max. What are the limitations of this algorithm? How will you overcome these limitations? '09 '10
- 7) Explain the concept of AND-OR graph. '09
- 8) Write down the format of generalized modus ponens inference rule. '08
- 9) With the help of proper example explain the concept of forward reasoning. '08
- 10) Describe the minimax search procedure with proper example. '07
- 11) Why planning are hard? How to make planning easier? '07
- 12) How does planning algorithm work? Why planning is so important for any AI agent? Explain with a relevant example. '12 '13

## Set 5

- 1) Identify three application areas where reasoning under conditions of uncertainty is necessary and explain briefly, why? '13
- 2) Give a general definition of a Bayesian Network. Explain how a BN represents a joint probability distribution. '12
- 3) Give a definition of Maximum Expected Utility and explain why the concept is useful in context of decision making. '12 '13
- 4) Bayesian Network related problem. See question paper. '12
- 5) Math problem. See question paper. '12
- 6) Briefly describe  $\alpha$ - $\beta$  pruning. Write down the properties of  $\alpha$ - $\beta$  pruning. '08 '11 '12
- 7) Define N-queens problem by stating its variables, domain and constraints. '11
- 8) Explain the steps of NLP. '10
- 9) Difference between top-down and bottom-up parsing? '07 '10 '12 '13
- 10) What do you mean by understanding? '09 Why understanding is hard? Explain. '08 '10
- 11) Show that the 8 puzzle states are divided into two disjoint sets, such that no state in one set can be transformed into a state in the other set by any number of moves. Devise a procedure that will tell you which class a given state is in and explain why this is a good thing to have for generating random states. '09
- 12) Prove that if a heuristic is consistent, it must be admissible. Construct an admissible heuristic that is not consistent. '09
- 13) Write down FC algorithm. What is the Arc consistency? '08 '09
- 14) Define the term cutting off search. '08
- 15) What is language technology? Mention several application of language technology. Describe the linguistic knowledge's that are essential to any NLP. Describe each of them. '07 '12 '13
- 16) Mention several parts of a Prolog program. Write a Prolog program for parsing the English sentence, "Rahim is a boy".
- 17) Why are the commercial games playing software non-losing usually? How will you represent a CHESS game into a state space? '07

## Set 6

- 1) What do you mean by NLP? Why Bengali Language Processing is so important? Mention at least five application areas of NLP. '12 '13
- 2) Parse the following sentences by proposing appropriate CFG's: i) Karim ekta boi porche. ii) Duita sundar pakhi akashe urchilo. '12 '13 Parse tree: i) He printed the file. ii) A student deleted my file. '10
- 3) Define morphemes in the following words and identify each of them: Unsuccessful, Industrialization. '13
- 4) Consider the following game tree and assume that the first player is the maximizing player. Which more should the first player choose? Figure: See question paper. '12
- 5) Why learning is important for AI agents? Establish a relationship between concept and version spaces. '13 + A set of positive and negative examples of the concept, "Bangladeshi economy car" has been given in the following. Figure: See question paper. How could you learn the concept, "Bangladeshi economy car", with the use of candidate elimination algorithm? '12
- 6) Briefly describe a perception realizing AND function. '11
- 7) Explain Incremental and Complete Assignment Strategy in CSP. '11
- 8) Briefly describe conceptual parsing. '11
- 9) Block world problem: Figure: See question paper. Now, show how STRIPS would solve this problem.



**Start:** ON(C, A)  $\wedge$

ONTABLE(A)  $\wedge$

ONTABLE(B)  $\wedge$

ARMEMPTY

**Goal:** ON(A, B)  $\wedge$  ON(B, C)

**Start:** ON (B, A)  $\wedge$

ONTABLE (A)  $\wedge$

ONTABLE (C)  $\wedge$

ONTABLE (D)  $\wedge$

ARMEMPTY

**Goal:** ON (C,A)  $\wedge$

ON (B,D)  $\wedge$

ONTABLE (A)  $\wedge$

ONTABLE (D)  $\wedge$

- 10) Briefly discuss the approaches used for creating a semantic representation of a sentence. '10
- 11) Problem on Map coloring: See question paper. '09
- 12) Prove the statement with necessary figure "If m is better than n for player, we shall never get to n in play" for alpha-beta pruning. '09
- 13) Write down the PEAS description of wumpus world. Also mention its characteristics. '08
- 14) Briefly describe about resolution. '09 How the logic are convert into CNF? '08
- 15) What is the difference between forward and backward chaining? '08
- 16) What do you mean by ATN? '10 The following figure shows an ATN in graphical solution: See question paper. Now trace the execution of this ATN to parse the following sentence: The long file has printed. '07
- 17) What is case grammar? How could you represent active and passive sentence by using case grammar, explain with examples. '07 '08 '09
- 18) Write down the advantages and disadvantages of semantic grammars. '07

## Set 7

- 1) What is the relationship between AI and Bayes theorem? Can you explain the physical significance of Bayes theorem in solving the real world problem? '13
- 2) Explain the compactness property of belief network with a suitable example. Prove that each entry in the EPT of belief network can be represented as  $P(x_1, \dots, x_n) = \prod_{i=1}^n P(x_i | \text{parents}(x_i))$ , where the symbols have their usual meanings. '13
- 3) Dr. Karim knows that the disease Malaria causes the patient, Tuhin to have flu. Say 60% of the time and Diabetes 40% of the time. Dr. Karim also knows some unconditional probability of having Malaria is 0.0005 and having Diabetes is 0.0025. If Tuhin having flu comes to doctor which treatment will be given to him? Why? '13
- 4) Write a Prolog program that sum up all the elements in a list. '12
- 5) Draw a decision tree using the information from table. Show branching up to depth-2. See Table: Question paper. '11
- 6) Short notes on: a) Supervised Learning b) MYCIN c) Transformational Analogy. '10
- 7) Describe whether each of the following sentences are valid, unsatisfiable or neither. Verify your decisions using truth tables or the equivalence rules of Figure: See question paper. '09
- 8) Consider the problem of devising a plan for cleaning the kitchen. See details in question paper. '08
- 9) What do you mean by learning? What are the advantages of alpha-beta cutoff algorithm over minimax algorithm? '07
- 10) Consider the following set of prepositions: a) Patient has spots b) Patient has measles c) Patient has high fever d) Patient has Rocky Mountain spotted fever e) Patient was recently bitten by a stick f) Patient has an allergy. Now identify the Patient's disease using Dempster Shafter Theory. i) What is 0? ii) Define a set of m functions that describe the dependencies among sources of evidences and elements of 0. '07
- 11) What is d-separator? Mention the conditions of d-separator and explain the conditions with example. '07

## Set 8

1) Monkey and Bananas problem. See question paper. '12

2) Develop a parse tree for sentence "Jack slept on the table" using the following rules.

$S \rightarrow NP VP$ ,  $NP \rightarrow N$ ,  $NP \rightarrow DET N$ ,  $VP \rightarrow V PP$ ,  $PP \rightarrow PREP NP$ ,  $N \rightarrow \text{Jack} | \text{Table}$ ,  $V \rightarrow \text{slept}$ ,  
 $DET \rightarrow \text{the}$ ,  $PREP \rightarrow \text{on}$  '11

3) What is the basic difference between ANN (Artificial Neural Network) and BNN (Biological Neural Network)? '11

4) Write a LISP or Prolog program to convert Fahrenheit temperatures to Centigrade and vice versa. '10 '11

5) What is expert system? In which ways expert systems differ from conventional computer systems? '10

6) Write short notes on: i) Learning by taking advice ii) Roof learning. '10

7) Write a short note on PROLOG. '10

8) Explain the steps of building an expert system. '08 '09

9) State and prove Bayes theorem. '08 '09

10) Write short note on decision trees. '08

NAFI '11

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