

III B.Tech II Semester Supplementary Examinations, Aug/Sep 2008
ARTIFICIAL INTELLIGENCE
(Computer Science & Systems Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

1. (a) Discuss about utility based agents.
 (b) Explain simple reflex agents. [8+8]
2. What are various blind search procedures and heuristic search strategies? Explain why they are named so, with your own example. [8+8]
3. "Foot hills, plateaus, and Ridge make hills hard to climb". Define the terms of above statement and explain the problems and solutions clearly. [16]
4. (a) Explain the weighted function with respect to evaluation function.
 (b) What is utility cutoff? [8+8]
5. (a) Explain forward and backward chaining in propositional logic
 (b) Consider the following axioms.
 P
 (P ∧ Q) → R
 (SVT) → Q
 T
 Prove R using resolution in propositional logic. [10+6]
6. (a) Here are two sentences in the language of first-order logic:
 i. $\neg \forall x \exists y (x >= y)$
 ii. $\exists y \neg \forall x (x >= y)$
 Assume that the variable range over all natural numbers 0, 1, 2, . . . , and that the ">=" predicate means "greater than or equal to". Try to prove that (i) follows from (ii) using resolution; continue until the proof breaks down and you cannot proceed. Show the unifying substitution for each resolution step. If the proof fails, explain exactly where, how, and why it breaks down
 (b) Now try to prove that (ii) follows from (i) [8+8]
7. (a) Explain planning with state space search
 (b) Explain with example heuristic state space search. [8+8]
8. (a) Explain the major issues that affect the design of the learning element.
 (b) Explain various forms of learning [8+8]

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1. How new neural network architectures receive the known facts about working of human brain? Explain with diagrams. [16]
2. What is a greedy best first search? Explain with example and diagram. [16]
3. Explain the local search for constraint satisfaction problem with an algorithm and diagram. [16]
4. (a) Explain why games are useful to explore machine intelligence?
 (b) Explain why exhaustive search of the game-tree is impossible. [8+8]
5. (a) What do you mean by monotonicity? Are propositional and first-order logic monotonic?
 (b) Is the sentence "Either $2+2=4$ and it is raining, or $2+2=4$ and it is not raining" making a claim about arithmetic, weather, or neither? Explain.
 (c) Look at the following sentences and decide for each if it is valid, unsatisfiable, or neither using equivalence rules.
 - i. $((\text{smoke} \wedge \text{heat}) \rightarrow \text{fire}) \Leftrightarrow ((\text{smoke}$
 - ii. $(\text{big} \vee \text{dumb}) \vee (\text{big} \rightarrow \text{dumb}).$ [6+6+4]
6. (a) Comment on propositional Vs first-order inference
 (b) How can resolution be used to show that a sentence is
 - i. valid
 - ii. unsatisfiable

For each of the following pairs of atomic sentences, give the most general unifier if it exists

 - i. $P(A,B,B), P(X,Y,Z)$
 - ii. $Q(Y, G(A,B)), Q(G(X,X),Y)$ [6+6+4]
7. (a) What are the limitations of the problem solving approach and what is the motivation behind the design of planning systems
 (b) What do you mean by state space search?
 (c) What do you mean by regression planning? [6+6+4]

Code No: R05321506

Set No. 2

8. What are decision trees? Draw a decision tree for the problem of deciding whether or not to move forward at a road intersection given that the light has just turned green.

[16]

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1. (a) What are simple reflex agents? Explain with a diagram.
(b) What are model based reflex-agents? Explain with a diagram. [8+8]
2. (a) Define a heuristic function and explain the linear combination with an example.
(b) Explain the hill climbing, local maximum and plateau with diagram. [8+8]
3. Explain each of the following with an example:
 - (a) Constraint graph
 - (b) Constraint satisfaction problem
 - (c) Cryptarithmic puzzle. [4+6+6]
4. Explain the following with respect to minimax procedure.
 - (a) Static evaluation function.
 - (b) Maximizing ply, Maximizing player
 - (c) Manimizing ply, Manimizing player
 - (d) Minimax procedure. [3+3+3+7]
5. (a) Give the outline of a knowledge-based agent program
(b) Give rules of inference for propositional logic
(c) Look at the following sentences and decide for each if it is valid, unsatisfiable, or neither using equivalence rules.
 - i) $(\text{smoke} \rightarrow \text{fire}) \rightarrow (\neg \text{smoke} \neg \text{fire})$
 - ii) $(\text{smoke} \rightarrow \text{fire}) \rightarrow ((\text{smoke} \wedge \text{heat}) \rightarrow \text{fire})$[6+6+4]
6. Write down logical representations for the following sentences suitable to use with Generalized Modus Ponens:
 - (a) Horses, cows and pigs are mammals
 - (b) An offspring of a horse is a horse
 - (c) Bluebeard is a horse
 - (d) Offspring and parent are inverse relations

(e) Every mammal has a parent.

Draw the proof tree generated by an exhaustive back-ward chaining algorithm for the query $\exists h \text{ Horse}(h)$. [16]

7. (a) Give partial order planning

(b) Distinguish between forward state space search and backward state space search.

[8+8]

8. (a) Explain about inducing decision trees from examples

(b) Explain EM algorithm.

[8+8]

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1. What is 8-puzzle problem? By giving an example explain a stupid move in 8-puzzle problem. [16]
2. When would best-first search be worse than simple breadth first search? Explain with an example and diagram. [16]
3. (a) "Hill climbing behaviour is a straight line but best-first search keeps tracks of all lines". Justify above statement with an example.
 (b) Write about local maximum and global maximum in hill climbing. [12+4]
4. What is pruning? Explain the role of evaluation function in Alpha-Beta pruning. [16]
5. Jones, Smith, and Clark hold the jobs of programmer, knowledge engineer, and manager. Jones owes the programmer \$10. The manager's spouse prohibits borrowing money. Smith is not married. Your task is to figure out which person has which job. Solve the problem using propositional logic. [16]
6. (a) Comment on propositional Vs first-order inference
 (b) How can resolution be used to show that a sentence is
 - i. valid
 - ii. unsatisfiable
 For each of the following pairs of atomic sentences, give the most general unifier if it exists
 - i. $P(A,B,B), P(X,Y,Z)$
 - ii. $Q(Y, G(A,B)), Q(G(X,X),Y)$ [6+6+4]
7. (a) What are the limitations of the problem solving approach and what is the motivation behind the design of planning systems
 (b) What do you mean by state space search?
 (c) What do you mean by regression planning? [6+6+4]
8. (a) Give the general model of learning agents
 (b) Explain inductive learning. [8+8]
