Roll No.								

B.E / B.Tech (Full-time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2011
COMPUTER SCIENCE AND ENGINEERING BRANCH

CS481 ARTIFICIAL INTELLIGENCE
EIGTH SEMESTER

REGULATIONS 2005

Time : 3 hr **Max Mark : 100**

Answer ALL Questions

Part – A (10x2 = 20Marks)

1. Define in your own words (i) artificial intelligence and (ii) agent.
2. Develop a PEAS description of the task environment for Refinery controller.
3. Define least-constraining value and minimum remaining value heuristics used in Constrained Satisfaction problems.
4. For certain game trees, there is a need for including 'chance nodes' in addition to MAX and MIN nodes. Why? Give an example.
5. Mention the different ways of representing facts. Use any one method to represent the following fact: *Amphibians live on land and in water.*
6. Which of the following FOL statements translate to "*Everyone who studies at Koblenz is smart*"? Give reason
   a. $\forall x$ *(StudiesAt(x;Koblenz))* $\Longrightarrow$ *Smart(x))*
   b. $\forall x$ *(StudiesAt(x;Koblenz)* ^ *Smart(x))*
7. Compare active and passive reinforcement learning.
8. Briefly describe the concept of 'boosting' as an ensemble learning method.
9. Define 'Reference Resolution' as a sub-problem of Discourse Understanding.
10. Explain how probability is used in Content Free Grammars for processing natural Language.

Part – B (5x 16 = 80 Marks)

11. (i) Explain the Recursive Best First Search. (4)
    (ii) Consider the 8-queens problem. Give the Depth limited search and explain how to avoid repeated states. (12)

12.a(i) Give the precise formulation for the Class Scheduling Problem as a Constraint Satisfaction Problem (CSP).
Class Scheduling Problem: There are fixed number of professors and classrooms, a list of classes to be offered and a list of possible time slots for classes. Each professor has a set of classes that he or she can teach. (10)
(ii) Explain in detail sensorless and contingency problems. (6)

(OR)

b(i) Describe the Minimax algorithm. Discuss how the α-β pruning technique helps to overcome the drawbacks of the Minimax search method. (10)

(ii) With the help of a graph, distinguish between global and local minima with respect to hill climbing search. Explain how the concepts of simulated annealing search and local beam search are used in hill climbing. (6)

13.a (i) Write and explain the Prolog program for the 'delete' predicate.
delete (X, L1, L2): X is an element which is deleted from List L1 resulting in the List L2. With the delete predicate explain the concepts of unification, resolution, and backtracking (10)

(ii) Simulate the working of the above predicate for the following examples. Show clearly the instantiation of the variables both in the forward and reverse direction. In case of more than one solution, show all solutions. (6)

?delete(a, [a,b,c,d],L2)
?delete(X,[a,b,c], L2)

(OR)

b. Given the following sentences

- John likes all kinds of food
- Apples are food
- Chicken is food
- Anything anyone eats and is not killed by is food
- Bill eats peanuts and is still alive
- Sue eats everything Bill eats

(i) Translate these sentences into formulae in predicate logic. (6)
(ii) Convert the formulae into clausal form (6)
(iii) Explain the ontology of situation calculus (4)

14a. (i) Give the decision tree learning algorithm. (4)

(ii) Consider the problem of deciding whether you have to pursue masters degree (*WillPursue*)or join a job, given that you have completed your under-graduation. Draw a decision tree for the problem with the *WillPursue* as the goal predicate (4)

(iii) Give a training set of at least 6 examples of your own for your decision tree. (2)

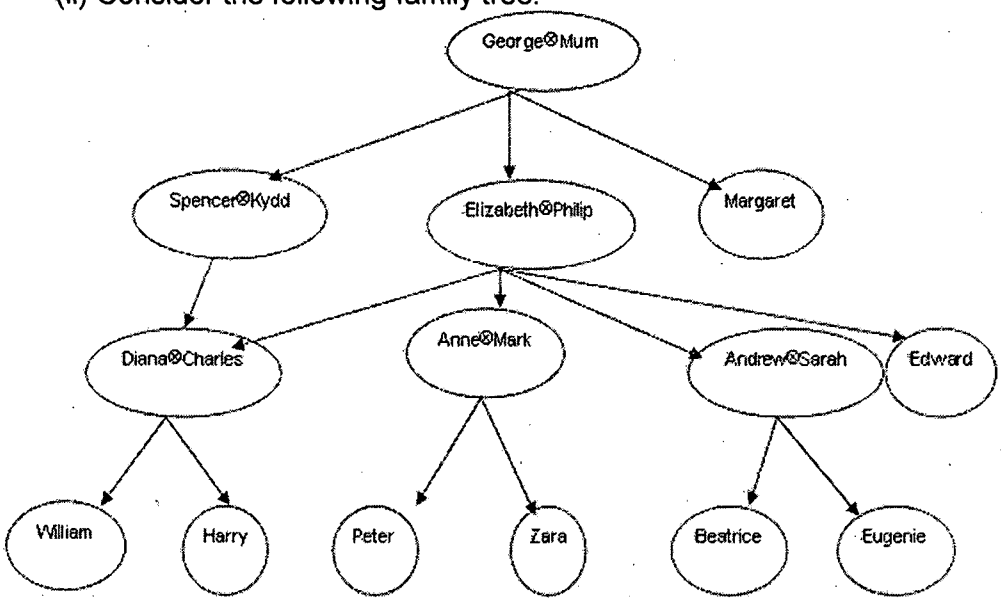
(iv) Now find a decision tree for the given problem that agrees with the training set. (2)

(v) Explain the concept of Explanation Based Learning with an example. (4)

(OR)

b(i) Distinguish between: specialization of the general models and generalization of the specific models with respect to Version Space Learning. (4)

(ii) Consider the following family tree:



Assume ***Father*** and ***Mothe***r Predicates are given. Explain clearly how Inductive Logic Programming can be used to learn the ***Ancestor*** relationship. (6)

(iii) Describe Bayesian learning with an example. Mention the approximations in *Max A Posteriori* (MAP) and *Max Likelihood* (ML) hypothesis? (6)

15.a (i) Given the example: "The man ate the apple in the evening". Write an appropriate grammar and generate a parse tree. (12)

(ii) Explain the concepts of Agreement and verb sub-categorization in the context of Natural Language Programming. (4)

(OR)

b (i) Explain the different types of Ambiguity associated with Natural Language. (6)

(ii) Explain the components of typical Information Retrieval System and explain how Information Retrieval Systems are evaluated. (10)

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