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Question Paper Code : 51352

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Sixth Semester

Computer Science and Engineering

CS 2351/ CS 61— ARTIFICIAL INTELLIGENCE

(Common to Seventh Semester –Electronics and Instrumentation Engineering)

(Regulation 2008/2010)

(Common to PTCS 2351 –Artificial Intelligence for B.E (Part–Time) Sixth Semester Computer Science and Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. Give the structure of an agent in an environment.

2. List the criteria to measure the performance of search strategies.

3. $P \Rightarrow Q \Rightarrow \neg PVQ$ Construct a truth table to show that this equivalence holds.

4. Write the generalized modus ponens rule.

5. List out the various planning techniques.

6. What is contingency planning?

7. List down two applications of temporal probabilistic models.

8. Define uncertainty.

9. List some applications where reinforcement learning is used.

10. What are the three factors involved in the analysis of efficiency gains from EBL(Explanation Based Learning)?

PART B — (5 × 16 = 80 marks)

11. (a) (i) What are the problems caused due to incomplete knowledge on the states or actions? Define each with example. (8)

(ii) Describe constraint satisfaction problem in detail. (8)

Or

(b) (i) Explain the components of problem definition with an example. (8)

(ii) Briefly explain the search strategies in uninformed search. (8)

12. (a) (i) What are the steps to convert First order logic sentence to Normal form? Explain each step. (6)

(ii) Represent the following sentences in predicate logic and convert the following sentences to CNF form

(1) All women who like ice-creams like chocolates. (2)

(2) No man is happy with a spendthrift wife. (2)

(3) The best movie in Hollywood is always better than the best movie in Bollywood. (2)

(4) Some people like eating outside all the time and some people like eating at home all the time (2)

(5) It might be argued that one aspect of intelligent behavior is the ability to infer new facts about the world by combining existing ones. Has the theory of logic given us a tool to allow computers to display this sort of intelligence? Can humans make other leaps of inference that are impossible with logic alone? (2)

Or

(b) (i) Differentiate propositional logic with FOL. List the inference rules along with suitable examples for First order Logic. (10)

(ii) Consider the following sentences:

(1) John likes all kinds of food.

(2) Apples are food.

(3) Chicken is food.

(4) Anything anyone eats and isn't killed alive.

(5) Sue eats everything bill eats.

(A) Translate these sentences into formulas in predicate logic.

(B) Convert the formulas of a part into clause form.

(C) Prove that "John likes peanuts" using forward chaining.

(D) Prove that "John likes peanuts" using backward chaining.

13. (a) (i) Give a detailed account on the planning with state —space research. (8)

(ii) Explain the concept behind partial order planning with examples. (8)

Or

(b) (i) Explain the process of modifying the planner for decompositions with suitable examples. (8)

(ii) Describe planning graph in detail. (8)

14. (a) (i) Define uncertain knowledge, prior probability and conditional probability. State the Baye's theorem. How is it useful for decision making under uncertainty? Explain belief networks briefly. (6)

(ii) What is a Bayesian network? How is the Bayesian network used in representing the uncertainty about knowledge? Explain the method of performing exact inference in Bayesian Networks. (10)

Or

(b) (i) Describe the role of Hidden Markov Model in speech recognition. (8)

(ii) Consider the following facts; (8)

(1) I saw my cat in the living room 3 hours ago

(2) 2 hours ago my door blew open

(3) Three quarters of the time my door blows open, my cat runs outside the door.

(4) One hour ago I thought I heard a cat noise in my living. Assume I was half certain.

(5) In one hour period the probability that the cat will leave the room is 0.2. There is also a 0.2 probability that he may enter the room. What is the certainty that the cat is my living room? Use Bayesian networks to answer this.

15. (a) (i) Suppose you set this as a machine learning problem to a learning agent. You specify that the positives are the exams which are difficult. (10)

(1) Which would the most specific hypothesis that the agent would initially construct?

(2) How would the agent generalize this hypothesis in light of the second positive example? What are the other possible generalizations are there?

(3) How would you use the 2 hypotheses (from parts (1) and (2) to predict whether an exam will be difficult?

(4) What score would the 2 hypotheses get in terms of predictive accuracy over the training set, and which one would be chosen as the learned hypothesis?

(ii) Consider the problem of learning to play tennis. Are there aspects of this learning that are supervised learning? Is this supervised learning or reinforcement learning? (6)

Or

(b) (i) Consider a simple domain: waiting at a traffic light. Give an example of a decision tree for this domain. (8)

(1) Make a list of relevant variables.

(2) Explain how we can use the concept of information or expected information gain to determine which variable to choose, for a maximally compact decision tree.

(ii) For the case of learning to play tennis (or some other sport with which you are familiar). Is this supervised learning or reinforcement learning? (8)