
AMIETE – CS/IT (OLD SCHEME)

Time: 3 Hours

DECEMBER 2011

Max. Marks: 100

NOTE: There are 9 Questions in all.

- Please write your Roll No. at the space provided on each page immediately after receiving the Question Paper.
- Question 1 is compulsory and carries 20 marks. Answer to Q.1 must be written in the space provided for it in the answer book supplied and nowhere else.
- The answer sheet for the Q.1 will be collected by the invigilator after 45 Minutes of the commencement of the examination.
- Out of the remaining EIGHT Questions answer any FIVE Questions. Each question carries 16 marks.
- Any required data not explicitly given, may be suitably assumed and stated.

Q.1 Choose the correct or the best alternative in the following: (2×10)

- a. For solving water jug problem breadth-first search would work better than depth first search.
- (A) True (B) False
(C) Both are equally good (D) Nothing can be said
- b. Which of the following is simplest of the approaches:
- (A) means-ends analysis (B) generate and test
(C) hill climbing (D) best first search
- c. Fairly good way of dealing with local maxima is
- (A) backtrack to some earlier node and try going in a different direction
(B) make a big jump in some direction to try to get to a new section of search
(C) apply two or more rules before doing the test
(D) none of these
- d. Clause form of $(P \vee Q) \rightarrow R$ is
- (A) $\sim P \vee R$ (B) $\sim Q \vee R$
(C) $P \vee Q \vee R$ (D) (A) and (B) both
- e. Resolution theorem is
- (A) Sound (B) Complete
(C) Neither sound nor complete (D) Sound and complete both
- f. Let $P(G \wedge T) = 1/3$ and $P(T) = 2/3$, then $P(G/T) =$
- (A) $2/9$ (B) $1/3$
(C) $1/2$ (D) $2/3$

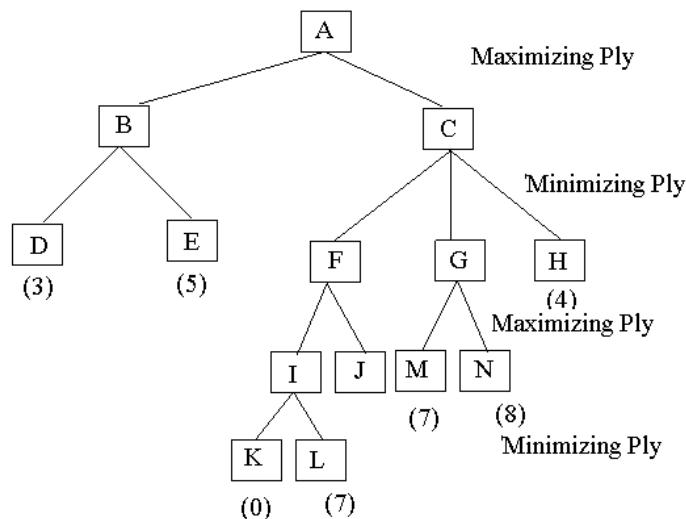
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- g. A Computer program that performs a task normally done by a human expert is
- (A) Neural Network (B) Semantic Network
(C) Expert System (D) None of these
- h. Learning by analogy involves learning
- (A) from a single training instance by explaining it.
(B) from a teacher or a knowledge source.
(C) new concepts through use of similar concepts and their solutions.
(D) None of these.
- i. Momentum term in Backpropagation learning is used to increase the
- (A) speed of learning (B) convergence
(C) weight adaptation (D) none of these.
- j. If laundry quantity is “large” ($\mu_A = 0.6$) and fabric is “hard” ($\mu_A = 0.8$) then washing cycle is “strong”. What is membership function of “strong”?
- (A) 0.8 (B) 0.7
(C) 0.6 (D) 0

**Answer any FIVE Questions out of EIGHT Questions.
Each question carries 16 marks.**

- Q.2** a. What do you understand by constraint satisfaction problems? Illustrate with example. (8)
- b. Consider a finite tree of depth d and branching factor b . (A tree consisting of only root node has depth zero; a tree consisting of a root node and its successors has depth 1; etc). Suppose the shallowest goal node is at depth $g \leq d$. What is the minimum and maximum number of nodes that might be generated by a depth first search? (8)

Q.3 Given below a game tree:



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- (i) If the first player is a maximizing player, then what move should be chosen under min-max procedure? (8)
- (ii) What nodes would not be examined using $\alpha - \beta$ pruning procedure? (8)
- Q.4** a. Show that $(\neg Q(c) \Rightarrow \neg P(c))$ is a logical consequence of $(\forall X) ((P(X) \Rightarrow Q(X)) \wedge R(X))$ using resolution refutation method. (8)
- b. Draw semantic network of the following sentence
Yesterday Kavita flew from New Delhi to Bangalore. (8)
- Q.5** a. You are given the following PROLOG program
 vehicle(X):- heavy(X).
 light(X):- car(X).
 heavy(X):- bus(X).
 heavy(X):- truck(X).
 car(zen).
 car(swift).
 bus(tata).
 bus(ashok).
 truck(mahindra).
 What will be the output of the query ?- vehicle(X) in each of the cases if the following rule is added in the beginning of the above program.
 (i) vehicle(X):- light(X).
 (ii) vehicle(X):- light(X),!.
 (iii) vehicle(X):- !, light(X).
 (iv) vehicle(X):- light(X),fail.
 (v) vehicle(X):- light(X),fail,!.
 (vi) vehicle(X):- light(X),!,fail. (6)
- b. Write a Prolog program to merge two sorted lists. i.e. merge(L₁, L₂, L₃).
 e.g. L₁ = [1,5,6] , L₂ = [2,3,8] , L₃ = [1,2,3,5,6,8]. (10)
- Q.6** a. How is A* search algorithm different from depth first algorithm. Explain the conditions under which A* will give optimal solution. (6)
- b. Design a perceptron for AND function of two inputs. Define appropriate weights and bias in the range [-1, 1] and use step activation function where if weighted sum is strictly greater than 0 then output 1 and if it is strictly less than 0 then output 0. (10)
- Q.7** a. Name the various Heuristics used for planning using Constraint Posting. (8)
- b. Suppose that we are given the probabilities of some events such as ‘Sun is bright today’ as $P(\text{sunny_today}) = 0.6$ and the probability of the same event occurring tomorrow as $P(\text{sunny_tomorrow} / \text{sunny_today}) = 0.8$ and $P(\text{sunny_tomorrow} / \sim \text{sunny_today}) = 0.4$. Compute the following joint probabilities. Let us represent *Sun is bright today* by A and *Sun will bright tomorrow* by B.
 (i) P(B, A) (ii) P(\sim B, A)
 (iii) P(B, \sim A) (iv) P(\sim B, \sim A) (8)

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- Q.8** a. Give two examples of each of the following and briefly describe each model
- (i) Supervised Learning
 - (ii) Unsupervised Learning (8)
- b. Discuss the architecture of Rule Based Expert System. (8)
- Q.9** a. Suppose that there are n and m number of two unary predicates p and q respectively in prolog program. How many times will prolog interpreter backtracks (including shallow and deep both) for each of the following queries?
- (i) $? p(X), q(Y)$
 - (ii) $? p(X), !, q(Y)$ (6)
- b. Explain ATN for parsing. How is it different than RTN? (10)