MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

CS-703C

ARTIFICIAL INTELLIGENCE

Time Allotted: 3 Hours | Full Marks: 70

The questions are of equal value.
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.
All symbols are of usual significance.

GROUP A
(Multiple Choice Type Questions)

1. Answer *all* questions. $10 \times 1 = 10$

(i) A Bayesian network is a
(A) tree (B) directed graph
(C) undirected graph (D) none of these

(ii) Which is NOT a heuristic search?
(A) A* search (B) Steepest ascent Hill-climbing
(C) Simulated annealing (D) Depth first search

(iii) "Lata is slightly ill". This statement can be completely expressed in
(A) FOPL (B) Propositional logic
(C) Fuzzy logic (D) None of these

(iv) Uninformed search is also known as
(A) brute force search (B) hill climbing search
(C) blind search (D) none of these

(v) For a given proposition q, $q \vee \neg q$ is a
(A) tautology (B) contradiction
(C) satisfiable formula (D) none of these

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Both a and b ?

(vi) Which of the following is there in Prolog?
(A) Existential quantifier (B) Universal quantifier
(C) Conjunction (D) Disjunction

(vii) Inheritable knowledge is best represented by
(A) semantic net (B) database (C) first order logic (D) none of these

(viii) The first order logic is
(A) both sound and complete (B) shound but not complete
(C) complete but not sound (D) neither sound nor complete

(ix) If in a problem the number of initial states is much more than the number of final states we should use
(A) backward reasoning (B) forward reasoning ?
(C) both (A) and (B) (D) none of these

(x) Which of the following is NOT a conflict resolution strategy in production systems?
(A) Production rules (B) Recency (C) Refraction (D) Specificity

GROUP B
(Short Answer Type Questions)

Answer any *three* questions. $3 \times 5 = 15$

2. (a) What is the difference between Greedy best-first search and A* search? 1
(b) Under what condition is breadth-first search optimal? 1
(c) Show that any monotonic heuristic is admissible. 3

3. (a) What is semantic net? 2
(b) With the help of semantic net, represent the fact that Sourav is 6 feet tall and that he is taller than Sachin. 3

4. What do you mean by completeness of a search? Why is DFS not always complete? 2+3

5. (a) Define Horn Clause. 1
(b) Is $p \rightarrow q$ a Horn Clause? Justify your answer. 2
(c) What is meant by tautology in propositional logic? 2

6. What is an expert system? Why is it required? 2+3

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GROUP C
(Long Answer Type Questions)

Answer any *three* questions. 3×15 = 45

7. (a) Consider the following 3-puzzle problem: 5+2+5

Start State

2	3
1	

Goal State

1	2
	3

Possible operators (in order) are up, down, left and right, Assume that repeated states are not detected. Label each visited node with a number indicating the order in which they are visited.

(i) Draw the search tree using BFS

(ii) Would DFS find the goal? Explain.

(iii) A* search with the heuristic being the number of misplaced tiles.

(b) Prove that A* is admissible. 3

8. (a) Consider the following game tree. 4+6

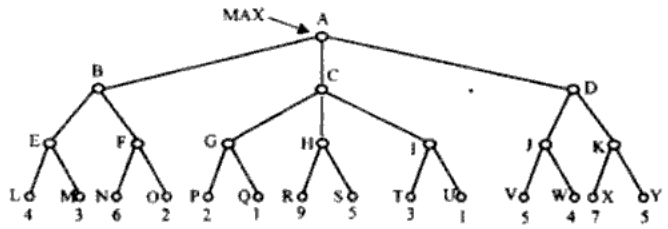

Fig - 1

(i) Using MINIMAX procedure, determine what moves should be chosen by the maximizer in his first turn.

(ii) Execute Alpha-Beta pruning on the above game tree. How many terminal nodes are examined? For each cutoff specify whether it is an Alpha-cutoff or Beta-cutoff.

(b) Justify each of the following statements: 2+3

(i) BFS is a special case of Uniform-Cost search

(ii) Uniform-Cost search is a special case of A* search

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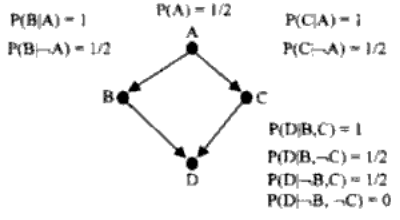
9. (a) Convert the following sentences into first order predicate logic: 4

(i) Everyone likes Ram (ii) No one is perfect

(iii) Someone ate everything (iv) All basketball players are tall

(b) An admission committee for a college is trying to determine the probability that an admitted candidate is really qualified. The relevant probabilities are given in the Bayes network shown below. Calculate P(A|D). 5



A= applicant is qualified.

B= applicant has high grade point average.

C= applicant has excellent recommendations.

D = applicant is admitted.

(c) Compare and Contrast between 3+3

(i) Forward and Backward reasoning

(ii) Inheritable knowledge and inferential knowledge

10.(a) Translate the following into clausal form: 6

$(\forall x)(P(x) \rightarrow ((\forall y)(P(y) \rightarrow P(f(x, y))) \wedge \sim (\forall y)(Q(x, y) \rightarrow P(y))))$

(b) Given the following text "Everyone who enters in a theatre has bought a ticket. Person who does not have money can't buy ticket. Vinod enters a theatre." Prove by resolution that "Vinod buys a ticket". 4

(c) Write a program in PROLOG or LISP clause for having DOUBLE (L, LL). Each element in the list L appears twice in the list LL. For example DOUBLE ([1, 2], [1, 1, 2, 2]) is true. 5

11. Write short notes on any *three* of the following: 3×5

(a) Genetic Algorithm

(b) Semantic net

(c) Neural Network

(d) Fuzzy set

(e) Simulated Annealing