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WEST BENGAL UNIVERSITY OF TECHNOLOGY

IT-605D

ARTIFICIAL INTELLIGENCE

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.

GROUP A
(Multiple Choice Type Questions)

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

(i) Skolem function is used in-
(A) Unification algorithm (B) Conversion to clausal form
(C) Natural deduction (D) None of these

(ii) If in a problem the number of initial state is much more than the number of final state, we should use
(A) forward reasoning (B) backward reasoning
(C) both (A) and (B) (D) None of these

(iii) Which of the following does not face local maxima problem
(A) Simple hill climbing (B) Steepest ascent hill climbing
(C) Best first search (D) None of these

(iv) Indicate which of the following is appropriate-
(A) All man are people is a valid wff
(B) Vx: man(x) → person(x) is a valid wff
(C) both (A) and (B) are a valid wff
(D) none of these is a valid wff

(v) Expert system shells provide mechanisms for:
(A) Knowledge Representation (B) Reasoning and Explanation
(C) Knowledge Acquisition (D) All of these

(vi) Which is a heuristic search?
(A) Hill climbing (B) BFS
(C) Constraint satisfaction search (D) All of these

(vii) A Bayesian network is a
(A) Tree (B) Directed graph
(C) Undirected graph (D) None of these

(viii) Inheritable knowledge is best represented by
(A) Semantic net (B) First order logic
(C) Database (D) None of these

(ix) Decomposable problem can be represented by
(A) OR graph (B) AND graph
(C) AND-OR graph (D) All of these

(x) Which of the following is not a conflict resolution strategy in production system
(A) Production rules (B) Regency
(C) Refractoriness (D) Specificity

GROUP B
(Short Answer Type Questions)

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

2. (a) What is Combinatorial Explosion? 2
(b) Explain briefly AND-OR graph. 3

3. Find out a path for the given goal state from initial condition. 5
Initial : on (*C*, *A*); clear (*C*); on (*B*, Table); clear (*B*)
Goal : on (*B*, *A*); on(*C*, *B*).

4. Write a PROLOG/LISP program to find the factorial of a given number. 5

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5. (a) Discuss different types of Knowledge. 2
   (b) What are the AI techniques? 2
   (c) State the components of Production system. 1

6. (a) How forward reasoning differs from backward reasoning? 2
   (b) Explain with suitable example. 3

GROUP C
(Long Answer Type Questions)

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

7. (a) Discuss and compare BFS and DFS technique. 4
   (b) Write down the differences between- 3+3
   (i) Procedural vs. Declarative knowledge.
   (ii) Neural Net Learning and Genetic Learning.
   (c) A farmer has a wolf, a goat and cabbage on the left side of the river. He has a boat that can carry at most one of the three with him, and he must transport this trio to the right bank. The problem is that he dare not leave the wolf with the goat or the goat with the cabbage. How does he do the transportation? 5

8. (a) What is Hill Climbing Technique? Describe it. 3+3+2
   What do you mean by Steepest Ascent Hill Climbing Technique?
   What are the problem of Hill Climbing search?
   (b) Convert the following statement into a well formed formula (w.f.f.) 2
   "Everyone is loyal to someone"
   (c) (i) Marcus was a man. 5
   (ii) Marcus was a Pompeian.
   (iii) Marcus was born in 40 A.D.
   (iv) All men are mortal.
   (v) All Pompeian died when the volcano erupted in 79 A.D.
   (vi) No mortal lives longer than 150 years.
   (vii) It is 2009 now
   Translate these sentences into formulas in predicate logic. Prove that Marcus is dead.

9. (a) What is an Agent? 1
   (b) Define Intelligent Agent (IA). 2

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   (c) Explain different class of IA. 3
   (d) Given two jugs with no measuring marker- a 6 gallon jug and 5 gallon jug. There is a pump to fill the jug with water. How do you get exactly 3 gallons of water in the 6 gallon jug? Give the state space for the problem, describe the production rules and give a possible solution and a search graph. 5+4

10.(a) What do you mean by A^* search? Explain. Prove that it is optimal and consistent. 2+3+3
   (b) A Salesman has a list of cities, each of which he must visit exactly once. There are direct roads between each pair of cities on the list. Find the *route* the salesman should follow for the shortest possible round trip that both starts and finishes at any one of the cities. 5+2

	A	B	C	D
A	–	100	120	170
B	100	–	150	170
C	120	150	–	150
D	170	170	150	–

   Describe how the *branch-and-bound technique* could be used to find the shortest solution to a salesman problem.
   Find out a *heuristic function* for this problem?

11.(a) Explain the Minimax search algorithm. 5
   (b) What do you mean by alpha beta pruning? 3
   (c) The game of NIM is played as following: Two players alternately removes one, two or three coins from a stack initially containing five coins. The player who picks up the last coin loses. Draw the full game tree and prove alpha-beta pruning process here. Prove that second player always have a possibility to win. 4+3

12. Write short notes on any *three* of the following: 3×5
   (a) Bayesian Network
   (b) Dempster-Shafer theory
   (c) Simulated Annealing Search
   (d) Local Beam Search
   (e) Genetic algorithms
   (f) Constraint Satisfaction Problem

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