GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2022

ARTIFICIAL INTELLIGENCE

CS701A

TIME ALLOTTED: 3Hours **FULL MARKS:70**

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)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

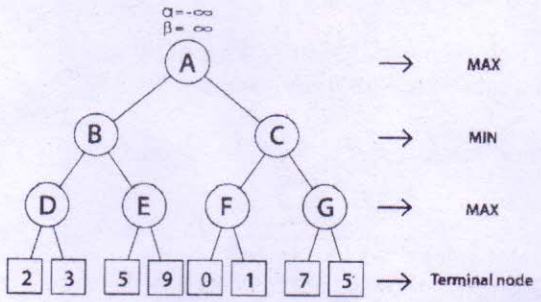
		Marks	CO No
(i)	The solution of the problem 'Plateau' is (a) Backtracking (b) Checking set of rules before using slope Planning (c) big jump (d) ignoring	1	CO3
(ii)	Which is not a Goal-based agent? (a) Inference (b) Search (c) Planning (d) Conclusion	1	CO2
(iii)	In case of Simplest Hill Climbing (a) 1st closer node is chosen (b) All successors are compared & then chosen the closest one (c) 2nd node is chosen (d) 1st remote node is chosen	1	CO1, CO3
(iv)	Which is not heuristic search? (a) Constraint satisfaction search (b) Depth First search (c) Conjunction (d) Disjunction	1	CO1, CO3
(v)	If b = branching factor and d = depth, then the space complexity of DFS is (a) $O(b^d)$ (b) $O(d^b)$ (c) O(b) (d) O(d)	1	CO1, CO3
(vi)	Algorithm that gives optimal solution is (a) Hill Climbing (b) BFS (c) Blind Search (d) A*	1	CO1, CO3

(vii)	The performance of an agent can be improved by (a) Learning (b) Observing (c) Perceiving (d) None of the mentioned	1	C
(viii)	Resolution can be used for (a) Question answering (b) Theorem proving (c) For both question answering and theorem proving (d) None of these	1	CO1
(ix)	A Bayesian Network is a (a) Tree (b) Directed graph (c) Undirected graph (d) None of these	1	CO1, CO3
(x)	Which of the following algorithm does not face local maxima problem? (a) Simple Hill Climbing (b) Steepest Ascent Hill Climbing (c) Best First (d) None of these	1	CO1, CO3
(xi)	Skolem function is used in: (a) Unification algorithm (b) Natural deduction (c) Conversion to clausal form (d) None of these	1	CO1, CO3
(xii)	If f(n) denotes the estimated cost of the cheapest solution through node n and h(n) denotes an estimate of cost of getting from current node n to goal node and g(n) denotes an estimate of cost of getting from initial node to current node n then A* algorithm uses (a) f(n) = g(n) + h(n) (b) f(n) = g(n) - h(n) (c) f(n) = g(n) * h(n) (d) f(n) = g(n) / h(n)	1	CO1, CO3

GROUP – B
(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

		Marks	CO No
2.	Use the alpha-beta pruning concept with respect to the following game tree to explain the advantage of the concept for avoiding exploration of unnecessary branches. The heuristic scores (from the player- A's point view) are shown at all terminal nodes of the game tree.	5	CO2



3.		Produce the following statement in first order predicate logic: a) There are some mobile phones that can take photographs. b) Tuna is a fish. c) The employees who earn more than 2 lakhs pay income tax. d) Mary likes all types of food. e) There are honest persons who do not believe in God	5	CO4
4.		Write a program in PROLOG to find the *n*th term of a Fibonacci series.	5	CO5
5.		Compare Breadth First Search and Depth First Search.	5	CO2
6.		What do you mean by completeness of a search? Why DFS is not always complete?	5	CO3

GROUP – C
(Long Answer Type Questions)

Answer any ***three*** from the following: **3×15=45**

			Marks	CO No
7.	a)	You have three jugs measuring 8 gallons, 5 gallons, and 3 gallons, and a water faucet. No measuring markers are there. You need to measure out exactly 4 gallons into 8-gallons jug, 4 gallons into 5-gallon jug and 0 gallon into 3-gallon jug. • Initial state: All three jugs are empty • Goal test: 4 gallons (in 8-gallon jug), 4 gallons (in 5-gallons jug), 0 gallon (in 3-gallons jug). Write the complete set of production rules to solve the problem and draw the state space diagram.	8	CO2
	b)	Consider the cryptarithmetic problem. Each letter stands for a distinct digit; the aim is to find a substitution of digits for letters such that the resulting sum is arithmetically correct, with the added restriction that no leading zero is allowed. Mention the VDC (Set of variables, set of domains, and set of constraints) while solving the problem. BASE + BALL ---------- GAMES	7	CO2
8.	a)	Convert the following wff into equivalent set of clauses:- $(\forall x)\{P(x)\rightarrow\{(\forall y)[P(y)\rightarrow P(f(x, y))]\wedge\sim(\forall y)[Q(x, y)\rightarrow P(y)]\}\}$	7	CO4
	b)	Consider the following: - i) Ram is father of Kush. ii) Dasarath is father of Lakshman. iii) Fathers are parents. Applying Resolution refutation prove that: Ram is parent of Kush.	8	CO4, CO5

9.	a)	What is an agent? What do you mean by rational agent? Explain.	5	CO2
	b)	Explain the PEAS description of the task environment for a Medical diagnostic system.	5	CO2
	c)	Differentiate between Goal-based agent and Utility-based agent.	5	CO2
10.	a)	What do you mean by a heuristic?	2	CO3
	b)	Solve the given problem using Best-First-Search technique. Provide the heuristic clearly.	10	CO1, CO3

Start State:

7	2	4
5		6
8	3	1

Goal State:

	1	2
3	4	5
6	7	8

	c)	Compare Hill-Climbing and Best First-Search.	3	CO3
11.		Write short notes on any three of the following:	3×5=15	
	a)	Dempster-Shafer theory	5	CO1
	b)	Expert system	5	CO1
	c)	Reasoning with fuzzy logic	5	CO2
	d)	Knowledge acquisition	5	CO2
	e)	Natural Language Processing	5	CO1