Exam Date & Time: 31-Dec-2020 (02:00 PM - 05:45 PM)

CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Artificial Intelligence [IT473]

Marks: 70   **Duration: 225 mins.**

SECTION-I

Answer all the questions.

1   Weak (Narrow) AI is _____

1) a set of computer programs that produce output that would be considered to reflect intelligence if it were generated by humans.	2) the study of mental faculties through the use of mental models implemented on a computer.	3) the embodiment of human intellectual capabilities within a computer.	4) All of the above	(1)

2   AI Technique is a manner to organize and use the knowledge efficiently in such a way that _____.

1) It should be perceivable by the people who provide it.	2) It should be easily modifiable to correct errors.	3) Both 1 and 2	4) None of the Above	(1)

3   USA + USSR = PEACE; P + E + A + C + E =?

1) 8	2) 9	3) 10	4) 11	(1)

4   In heuristic search algorithms in Artificial Intelligence (AI), if a collection of admissible heuristics h1 ....hm is available for a problem and none of them dominates any of the others, which should we choose?

1) $h(n)=\max\{h1(n),….,hm(n)\}$	2) $h(n)=\min\{h1(n),….,hm(n)\}$	3) $h(n)=\text{avg}\{h1(n),….,hm(n)\}$	4) $h(n)=\text{sum}\{h1(n),….,hm(n)\}$	(1)

5   Consider the following statements:

S1: A heuristic is admissible if it never overestimates the cost to reach the goal.

S2: A heuristic is monotonous if it follows triangle inequality property.

Which of the following is true referencing the above statements?

Choose the correct answer from the code given below:

Code:

1) Neither of the statements S1 and S2 are true	2) Statement S1 is false but statement S2 is true	3) Statement S1 is true but statement S2 is false	4) Both the statements S1 and S2 are true	(1)

6   Consider the following statements related to AND-OR Search algorithm.

S1: A solution is a subtree that has a goal node at every leaf.

S2: OR nodes are analogous to the branching in a deterministic environment.

S3: AND nodes are analogous to the branching in a non-deterministic environment.

Which of the following is true referencing the above statements?

Choose the correct answer from the code given below:

Code:

1) S1 – False, S2 – True, S3 – True	2) S1 – True, S2 – True, S3 – False	3) S1 – True, S2 – True, S3 – True	4) S1 – False, S2 – True, S3 – False	(1)

7   Which search implements stack operation for searching the states?

1) Depth-limited search	2) Depth-first search	3) Breadth-first search	4) None of the mentioned	(1)

8   Hill climbing sometimes called _____ because it grabs a good neighbor state without thinking ahead about where to go next.   (1)

1) Needy local search	2) Heuristic local search	3) Greedy local search	4) Optimal local search

9   What is Morphological Segmentation?

(1)

1)	Does Discourse Analysis	2)	Separate words into individual morphemes and identify the class of the morphemes	3)	Is an extension of propositional logic	4)	None of the mentioned

10   Which of the following is not the promise ofartificial neural network?

(1)

1)	It can explain result	2)	It can survive the failure of some nodes	3)	It has inherent parallelism	4)	It can handle noise

11   Graph used to represent semantic network is_____

(1)

1)	Undirected graph	2)	Directed graph	3)	Directed Acyclic graph (DAG)	4)	Directed complete graph

12   _____predicate calculus allows quantified variables torefer to objects in the domain of discourse and not to predicatesor functions.

(1)

1)	Zero-order	2)	First-order	3)	Second-order	4)	High-order

13   Identify the correct translation into logical notation of thefollowing assertion.

"Some boys in the class are taller than all the girls"

Note : taller(x,y) is true if x is taller than y.

(1)

1)	$(\exists x)\,(boy(x) \rightarrow (\forall y)\,(girl(y) \wedge taller(x,y)))$	2)	$(\exists x)\,(boy(x) \wedge (\forall y)\,(girl(y) \wedge taller(x,y)))$	3)	$(\exists x)\,(boy(x) \rightarrow (\forall y)\,(girl(y) \rightarrow taller(x,y)))$	4)	$(\exists x)\,(boy(x) \wedge (\forall y)\,(girl(y) \rightarrow taller(x,y)))$

14   Consider the following statement,

"After all the gathering of knowledge and planning thestrategies, the knowledge should be applied and the plans should beexecuted systematically to reach the goal state most efficientlyand fruitfully."

What does the above definition refer to?

(1)

1)	Knowledge gathering strategy	2)	Final step of solving the AI problem, which is applying the strategies	3)	State space deciding	4)	None of the above

15   A* is optimal if h(n) is an admissible heuristic-that is, providedthat h(n) never underestimates the cost to reach the goal.

(1)

1)	True	2)	False

16   Where does the Bayes rule can be used?

(1)

1)	Solving queries	2)	Increasing complexity	3)	Decreasing complexity	4)	Answering probabilistic query

17   Having multiple perceptron's can actually solve the XOR problemsatisfactorily: this is because each perceptron can partition off alinear part of the space itself, and they can then combine theirresults.

(1)

1)	True – this works always, and these multiple perceptron's learn to classify even complex problems	2)	False – perceptron's are mathematically incapable of solving linearly inseparable functions, no matter what you do	3)	True – perceptron's can do this but are unable to learn to do it – they have to be explicitly hand-coded	4)	False – just having a single perceptron is enough

18   Consider the following statement:

"The search first begins from the root node and the first one ofthe child node's sub-tree is completely traversed. That is, firstall the one-sided nodes are checked, and then the other sided nodesare checked."

Which search algorithm is described in the above definition?

(1)

1)	The Breadth First Search (BFS)	2)	The Depth First Search (DFS)	3)	The A* search	4)	None of the above

19   How should knowledge be represented to be used for an Ai Technique?

(1)

1)	When two individual situations are represented, knowledge should provide generalization such that only common properties of both situations are represented rather than representing both situations individually		2)	Knowledge should be represented such that it should be understood by the people who have provided it		3)	Knowledge should be represented in a way that it can be easily modified	4) All of these

20   Forward chaining systems are _____ where asbackward chaining systems are _____

(1)

1)	Goal-driven, goal-driven	2)	Goal-driven, data-driven	3)	Data-driven, goal-driven	4)	Data-driven, data-driven

SECTION-II

Answer 5 out of 7 questions.

21   (A) Figure below depicts the AO* algorithm working on a problem.The nodes are labelled with their heuristic values. The cost ofeach edge is given in the figure. Which of the following node(s),identified by their heuristic value, could the algorithmexpand/refine next? [2]
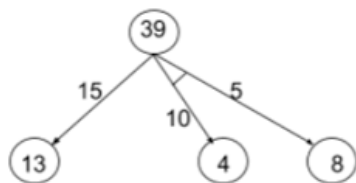
(B) Consider the following minimax game tree search. What willbe the value propagated at root? [3]
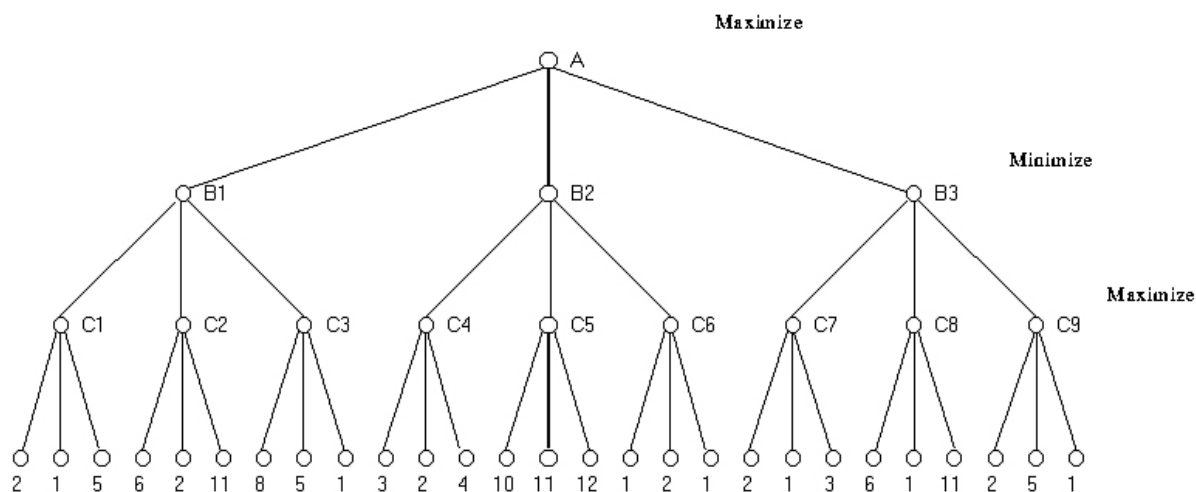
(5)

22   Perform the A* Algorithm on the following figure. Explicitly writedown the queue at each step. Find a path between A and G in thefollowing graph. (5)
The number attached to each edge in the graphrepresents the COST of traversing the edge. The number accompanyingeach node represents a heuristic under-estimate of the distance ofthe node to the goal G.
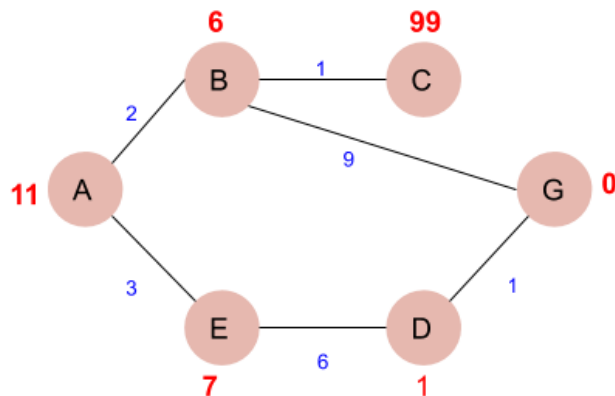
23 〔   〕〔   〕 Solve the following 8-puzzle problem using hill climbing algorithm.

The heuristic function to be used is set-up as h (n) = thenumber of misplaced tiles (excluding the blank tile).

1) Show all possible moves at each iteration of hill climbingalgorithm.

2) Show the best move after each iteration of hill climbingalgorithm.

3) State number of steps required to solve the puzzle (i.e.reaching global minimum)

(5)

1	2	3
4	8	
7	6	5

(Initial state)

1	2	3
4	5	6
7	8	

(Goal state)

24 〔   〕〔   〕 Differentiate: Forward Reasoning versus Backward Reasoning.

(5)

25 〔   〕〔   〕 What are the phases (steps) of NLP? Explain it in brief.

(5)

26 〔   〕〔   〕 Explain Semantic Network and Frame structure with suitable example.

(5)

27 〔   〕〔   〕 Consider the following axioms:

1. Anyone who has any cats will not have anymice.

2. All hounds howl at night.

3. Light sleepers do not have anything which howlsat night.

4. Asha has either a cat or a hound.

5. (Conclusion) If Asha is a light sleeper, thenAsha does not have any mice.

The conclusion you have to prove usingResolution

(5)

SECTION-III

Answer 5 out of 7 questions.

28 〔   〕〔   〕 Consider the below axioms:

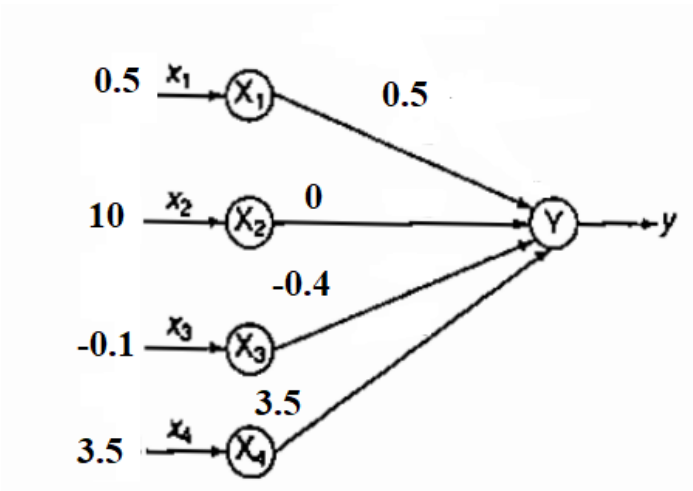(5)

1. Sonal loves all types of clothes.

2. Suits are clothes.

3. Jackets are clothes.

4. Anything any wear and isn't bad isclothes.

5. Siya wears skirt and is good.

6. Angali wears anything Siya wears.

Apply backward chaining and prove that Sonalloves Kurtis.

29		

For the network shown in figure, calculate the net input to the output neuron.

(5)

Use Binary and Bipolar Sigmoidal Activation Function.

30		

Consider two given fuzzy sets given below.

$\tilde{A} = \{ (x_1, 0.5), (x_2, 0.2), (x_3, 0.9) \}$

$\tilde{B} = \{ (x_1, 1), (x_2, 0.5), (x_3, 1) \}$

(5)

Find Relation by performing Cartesian Product over the given fuzzy sets.

31		

What is an expert system? Which are the types of users involved with expert system? Explain in brief.

(5)

32		

What are the basic knowledge representation issues? What are the considerations in knowledge representation?

(5)

33		

State and prove Bay's Theorem. Justify the use of Bay's Theorem in Bayesian Network.

(5)

34		

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     A  P  P  L  E
+    L  E  M  O  N
   _____

   B  A  N  A  N  A
```

(5)

Solve the above crypt arithmetic problem using constraint satisfaction procedure.

-----End-----