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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Seventh Semester B.Tech Degree Examination December 2022 (2019 scheme)

Course Code: CST401

Course Name: ARTIFICIAL INTELLIGENCE

Max. Marks: 100 **Duration: 3 Hours**

PART A

Answer all questions, each carries 3 marks. Marks

1		For the following activities, give a PEAS description of the task environment and characterize it in terms of the task environment properties. a) Interactive English tutor	(3)
2		Describe any two ways to represent states and the transitions between components in agent programs.	(3)
3		Define heuristic function? Give an example.	(3)
4		How do you evaluate the performance of a search algorithm?	(3)
5		Define node consistency with an example.	(3)
6		Define the term least constraining value in CSP	(3)
7		For the following pair of atomic sentences, give the most general unifier, if it exists: *Knows (Father(y), y), Knows (John, x)*	(3)
8		Prove, or find a counter example to, the following assertion: If $\alpha \models \gamma$ or $\beta \models \gamma$ (or both) then $(\alpha \wedge \beta) \models \gamma$	(3)
9		Define overfitting in learning	(3)
10		What is meant by supervised learning. Give an example	(3)

PART B

Answer any one full question from each module, each carries 14 marks.

Module I

11	a)	With diagram compare model based reflex agent and simple reflex agent programs in intelligent systems.	(8)
	b)	List and explain any three applications of AI.	(6)

OR

12	a)	Explain PEAS description and task environment properties with an example.	(8)

b) Explain Turing Test approach and Cognitive modelling approach in terms of Artificial Intelligence. (6)

Module II

13 a) State and explain the 5 components of a well-defined AI problem. Write the standard formulation for 8-queens problem. (8)

b) State the different conditions for optimality for A* search. Explain A * search with an example (6)

OR

14 a) Explain how the problem of 8-puzzle can be solved with the help of heuristics. (8)

b) Explain and compare the Breadth first search and Uniform cost search with the uninformed search evaluation strategies such as completeness, optimality, space and time complexities. (6)

Module III

15 a) Explain backtracking search in CSPs using the example of 4-queens problem. (8)

b) Illustrate the working of Minimax search procedure with an example. (6)

OR

16 a) Solve the following crypt arithmetic problem by hand, using the strategy of backtracking with forward checking and the MRV & least-constraining-value heuristics. (8)

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 TWO
+TWO
FOUR
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b) Explain alpha beta pruning with a simple example. (6)

Module IV

17 a) Illustrate the steps for converting First order logic (FOL) to Conjunctive Normal Form (CNF) with sentence- *"Ravi likes all kind of food."* (8)

b) Decide whether each of the following sentences is valid, unsatisfiable, or neither. Verify your decisions using truth tables or the equivalence rules (6)

i)Smoke ∨ Fire ∨ ¬Fire

ii)((Smoke ∧ Heat) ⇒ Fire) ⇔ ((Smoke ⇒ Fire) ∨ (Heat ⇒ Fire))

iii)(Smoke ⇒ Fire) ⇒ ((Smoke ∧ Heat) ⇒ Fire)

OR

18 a) Convert the following sentences into first order logic, FOL and corresponding Conjunctive Normal Form, CNF: (8)

a. John likes all kind of food.

b. Apple and vegetable are food

c. Anything anyone eats and not killed is food.

d. Anil eats peanuts and still alive

e. Harry eats everything that Anil eats.

b) Consider the following sentence: (6)
[(Food ⇒ Party) ∨ (Drinks ⇒ Party)] ⇒ [(Food ∧ Drinks) ⇒ Party].
Convert this to CNF

Module V

19 a) Explain decision tree learning algorithm. (8)

Consider the following data set comprised of three binary input attributes (A1 , A2 , and A3) and one binary output.

Example	A_1	A_2	A_3	Output y
$\mathbf{x}_1$	1	0	0	0
$\mathbf{x}_2$	1	0	1	0
$\mathbf{x}_3$	0	1	0	0
$\mathbf{x}_4$	1	1	1	1
$\mathbf{x}_5$	1	1	0	1

Use the DECISION-TREE-LEARNING algorithm to learn a decision tree for these data. Show the computations made to determine the attribute to split at each node.

b) What is entropy? What is its significance in the decision tree learning? (6)

OR

20 a) Differentiate between classification and regression. Give three different scenarios each, where these can be used. (8)

b) Explain Linear classification with logistic regression (6)

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