

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. | (3) |
| | a) Interactive English tutor | |
| 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: | (3) |
| | <i>Knows (Father(y), y), Knows (John, x)</i> | |
| 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

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

TWO
+TWO

FOUR

- 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. (6)
Verify your decisions using truth tables or the equivalence rules

i) $\text{Smoke} \vee \text{Fire} \vee \neg \text{Fire}$

ii) $((\text{Smoke} \wedge \text{Heat}) \Rightarrow \text{Fire}) \Leftrightarrow ((\text{Smoke} \Rightarrow \text{Fire}) \vee (\text{Heat} \Rightarrow \text{Fire}))$

iii) $(\text{Smoke} \Rightarrow \text{Fire}) \Rightarrow ((\text{Smoke} \wedge \text{Heat}) \Rightarrow \text{Fire})$

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)
 $[(\text{Food} \Rightarrow \text{Party}) \vee (\text{Drinks} \Rightarrow \text{Party})] \Rightarrow [(\text{Food} \wedge \text{Drinks}) \Rightarrow \text{Party}]$.
 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 (A_1 , A_2 , and A_3) and one binary output.

Example	A_1	A_2	A_3	Output y
x_1	1	0	0	0
x_2	1	0	1	0
x_3	0	1	0	0
x_4	1	1	1	1
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)
