

## INDIRA UNIVERSITY, PUNE

## SCHOOL OF INFORMATION TECHNOLOGY- MSC CS

Backlog Examination (2025 Pattern) April/ May – 2026 - Semester – I

Subject Name: Artificial Intelligence  
Subject Code: 25PSC106T

Max. Marks: 25  
Time: 1:30 Hrs.

## Instructions

- All Questions are Compulsory.
- Draw Neat Diagrams

| CO # | Cognitive Ability | Course Outcome                                                                                                                  |
|------|-------------------|---------------------------------------------------------------------------------------------------------------------------------|
| CO1  | Remember          | Describe fundamental concept, scope of AI related applications and its history, foundations, and early work in relevant fields. |
| CO2  | Understand        | Classify and distinguish the basic concepts of problem solving using Artificial Intelligence.                                   |
| CO3  | Apply             | Apply various types of algorithms used in Artificial Intelligence(AI) to solve real world problem.                              |

|            |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|
| Q1.        | <b>Attempt any 5 out of 7. (1 mark each)</b> <b>(5 Marks)</b><br>1. State any two subfields of AI.<br>2. Define Depth Limited Search.<br>3. What is FOPL?<br>4. Give the syntax for python TUPLE<br>5. What is Un-Supervised Learning?<br>6. State the advantages of Depth First Search (DFS).<br>7. List types of Heuristic Functions ?                                                                                                        | CO1 |
| Q2.        | <b>Attempt any 2 out of 4. (5 marks each)</b> <b>(10 Marks)</b><br>1. Discuss the concept of recursion in Python with an example of a factorial program.<br>2. Define what is search and explain difference between DFS & BFS?<br>3. Explain the K-Nearest Neighbour (KNN) algorithm.<br>4. Explain how an AI-based movie recommendation system works with an example.                                                                          | CO2 |
| Q.3.<br>a) | <b>Attempt all questions. (5 marks each)</b> <b>(10 Marks)</b><br>BASE +BALL = GAMES<br>Using Constraint Satisfaction Problem in terms of variables(V), domains(D) and Constraints (C)<br>1)Identify the initial solution, initial constraints.<br>2)Describe any one step of reducing the domain and creating additional constraints.<br>(Note- The aim is to assign each letter a unique integer in the range 0-9 so that the sum is correct) | CO3 |

| b)                                            | <div>Solve given search tree problem using Mini-Max algorithm</div> <div><pre>graph TD     A((A)) --- B((B))     A --- C((C))     B --- D((D))     B --- E((E))     C --- F((F))     C --- G((G))     D --- H((H))     D --- I((I))     E --- J((J))     E --- K((K))     F --- L((L))     F --- M((M))     G --- N((N))     G --- O((O))     H --- H_val[6]     I --- I_val[-4]     J --- J_val[8]     K --- K_val[-5]     L --- L_val[2]     M --- M_val[1]     N --- N_val[-1]     O --- O_val[3]</pre></div> <div>Show final search tree after applying algorithm, show min value at the root node.</div> <div>OR</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | CO3               |            |                 |                                                                 |                                    |                                                                                                        |                                 |                                                                                                                      |                                               |                                                                                                                                                                                          |                   |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------|-----------------|-----------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Q.3<br>a)                                     | <div>Attempt all questions.</div> <div>Consider the following English Statements and Their WFF's</div> <table><tr><th>English Statement</th><th>FOPL/WFF's</th></tr><tr><td>Jack owns a dog</td><td><math>\exists x: \text{dog} (x) \wedge \text{Owns} (\text{Jack}, x)</math></td></tr><tr><td>Every dog owner is an animal lover</td><td><math>\forall x: (\exists y: \text{Dog} (y) \wedge \text{Owns} (x, y) \Rightarrow \text{Animal Lover} (x))</math></td></tr><tr><td>No animal lover kills an animal</td><td><math>\forall x: \text{Animal Lover} (x) \Rightarrow (\forall y: \text{Animal} (y) \Rightarrow \sim \text{Kills} (x, y))</math></td></tr><tr><td>Either Jack or curiosity killed Tuna, the cat</td><td><math>\text{Kills} (\text{Jack}, \text{Tuna}) \vee \text{kills} (\text{curiosity}, \text{Tuna})</math><br/><math>\text{Cat} (\text{Tuna})</math><br/><math>\forall x: (\text{cat} (x) \Rightarrow \text{Animal} (x))</math></td></tr></table> <div>i)Construct WFF's to Clausal Normal Form Using Resolution build a solution tree to Prove, that Curiosity did not kill Tuna.</div> | English Statement | FOPL/WFF's | Jack owns a dog | $\exists x: \text{dog} (x) \wedge \text{Owns} (\text{Jack}, x)$ | Every dog owner is an animal lover | $\forall x: (\exists y: \text{Dog} (y) \wedge \text{Owns} (x, y) \Rightarrow \text{Animal Lover} (x))$ | No animal lover kills an animal | $\forall x: \text{Animal Lover} (x) \Rightarrow (\forall y: \text{Animal} (y) \Rightarrow \sim \text{Kills} (x, y))$ | Either Jack or curiosity killed Tuna, the cat | $\text{Kills} (\text{Jack}, \text{Tuna}) \vee \text{kills} (\text{curiosity}, \text{Tuna})$<br>$\text{Cat} (\text{Tuna})$<br>$\forall x: (\text{cat} (x) \Rightarrow \text{Animal} (x))$ | (10 Marks)<br>CO3 |
| English Statement                             | FOPL/WFF's                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |            |                 |                                                                 |                                    |                                                                                                        |                                 |                                                                                                                      |                                               |                                                                                                                                                                                          |                   |
| Jack owns a dog                               | $\exists x: \text{dog} (x) \wedge \text{Owns} (\text{Jack}, x)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |            |                 |                                                                 |                                    |                                                                                                        |                                 |                                                                                                                      |                                               |                                                                                                                                                                                          |                   |
| Every dog owner is an animal lover            | $\forall x: (\exists y: \text{Dog} (y) \wedge \text{Owns} (x, y) \Rightarrow \text{Animal Lover} (x))$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |            |                 |                                                                 |                                    |                                                                                                        |                                 |                                                                                                                      |                                               |                                                                                                                                                                                          |                   |
| No animal lover kills an animal               | $\forall x: \text{Animal Lover} (x) \Rightarrow (\forall y: \text{Animal} (y) \Rightarrow \sim \text{Kills} (x, y))$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |            |                 |                                                                 |                                    |                                                                                                        |                                 |                                                                                                                      |                                               |                                                                                                                                                                                          |                   |
| Either Jack or curiosity killed Tuna, the cat | $\text{Kills} (\text{Jack}, \text{Tuna}) \vee \text{kills} (\text{curiosity}, \text{Tuna})$<br>$\text{Cat} (\text{Tuna})$<br>$\forall x: (\text{cat} (x) \Rightarrow \text{Animal} (x))$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                   |            |                 |                                                                 |                                    |                                                                                                        |                                 |                                                                                                                      |                                               |                                                                                                                                                                                          |                   |
| b)                                            | <div>Explain the Random Forest algorithm with example.</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |            |                 |                                                                 |                                    |                                                                                                        |                                 |                                                                                                                      |                                               |                                                                                                                                                                                          |                   |

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