National University of Computer and Emerging Sciences
Karachi Campus

Artificial Intelligence (AI2002)

Sessional 1 Exam

Date: 26/5/2024

Total Time: 1 hr

Total Marks: 30

Total Questions: 02

Course Instructor(s)

Dr. Fahad, Bilal, Anaum, Nauraiz, Alina, Saif-Ur-Rehman, Yusra, Fizza, Ramsha, Saeeda, Farooq

_____ Roll No

_____ Section

_____ Student Signature

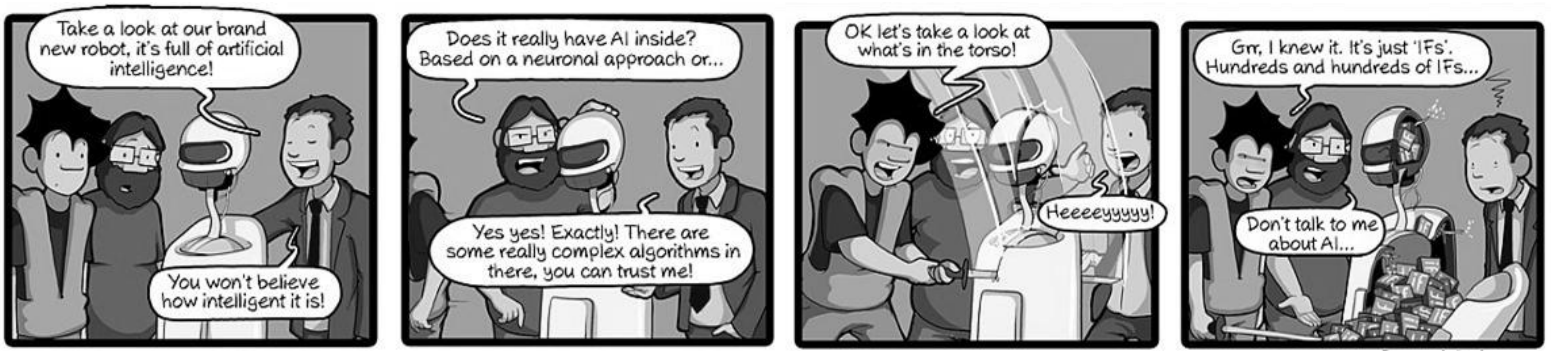
Do not write below this line.

Attempt All questions.

CLO1: To recognize the notions of rational behavior and intelligent agents.

[Marks 12, 3 each, 20 min]

Q1. Consider the comic below and answer the questions that follow: -

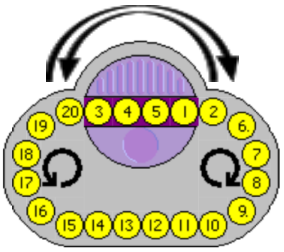


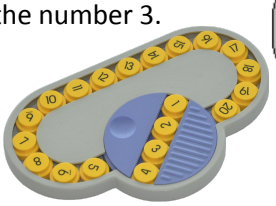
A. Which dimension of AI definitions best matches the context in the above comic? Give strong reasons.
B. What type of Agent did the robot turn out to be? Why were the guys disappointed to find many IFs? Isn't it AI?.
C. Give PEAS for solving a jigsaw puzzle.
D. Which of the categories of Nature of environments does solving jigsaw puzzles belong to? Cover all the characteristics of the task environment. (**HINT**: fully vs partially observable, deterministic vs nondeterministic etc.)

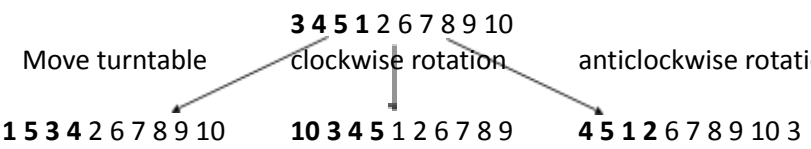
CLO2: To identify and relate methods of search and practically apply the corresponding techniques.

[Marks 18, 3 each, 40 min]

Q2. The Oval Track puzzle consists of 20 numbered round pieces in one long looped track. Users can slide all the pieces around the loop or use the turntable in the loop which can rotate any four adjacent pieces so that they will be in reverse order. The goal is to arrange the pieces in numerical order from some jumbled-up sequence.
Consider the Oval track puzzle with only 10 numbered round pieces. The tree shows the initial state and next actions with their corresponding states (up to level 1). The state is represented by a string of numbers starting with 4 numbers on the turntable. Imagine the last number is circling back to the first number. E.g. in the initial state the number 10 is adjacent to the number 3.







A. **i.** Complete the search tree up to level 4.
How many nodes of this search tree are visited if using **ii.** BFS **iii.** Depth Limited DFS with a limit of 4
Justify your answer by showing working and giving the order of states visited.

B. **i.** Suggest a suitable heuristic for the Oval Track Puzzle and show that your heuristic is admissible
Utilizing your heuristic how many nodes are visited if using: **ii.** A* Search **iii.** Greedy first Search
Justify your answer by showing working and giving the order of states visited.