

Artificial Intelligence

Assignment # 2

Start Date: 13-06-2024

Section: F2, F7

Total Marks: 90

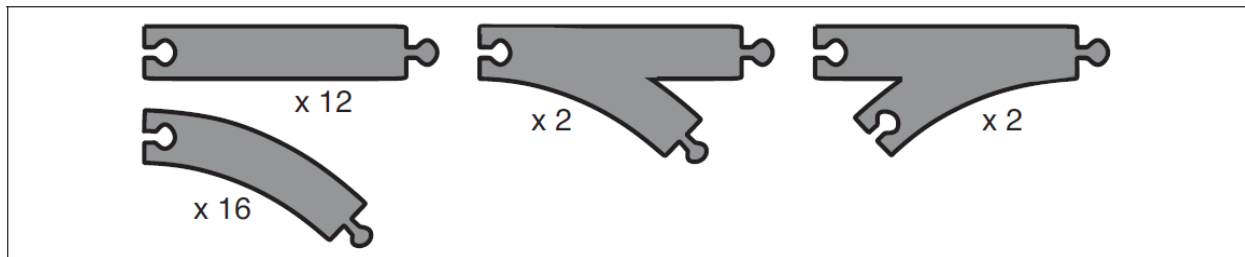
Due Date: 22-06-2024

Program: BSCS

Instructions

1. Upload the scanned PDF on the portal
 2. Understanding of the problems is part of the assignments.
 3. You will get Zero marks if found any type of cheating.
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Task 1



The track pieces in a wooden railway set; each is labelled with the number of copies in the set. Note that curved pieces and “fork” pieces (“switches” or “points”) can be flipped over so they can curve in either direction. Each curve subtends 45 degrees. A basic wooden railway set contains the pieces shown in figure. The task is to connect these pieces into a railway that has no overlapping tracks and no loose ends where a train could run off onto the floor.

- a. Suppose that the pieces fit together *exactly* with no slack. Give a precise formulation of the task as a search problem.
- b. Identify a suitable informed search algorithm for this task and explain your choice.

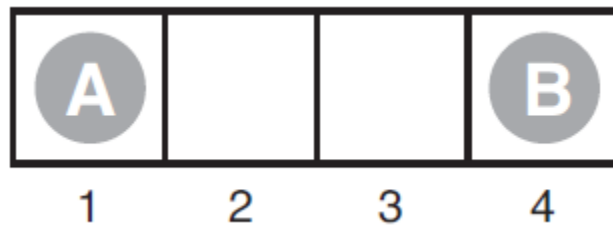
Task 2

Solve the TSP using GA and perform determine the third generation and assign any distance cost to different routes of your choice.

1. Evaluate the fitness of each individual, showing all your workings, and arrange them in order with the fittest first and the least fit last.
 - a. Perform the following crossover operations: Cross the fittest two individuals using one–point crossover at the middle point.

- b. Cross the second and third fittest individuals using a two-point crossover (points b and f).
 - c. Cross the first and third fittest individuals (ranked 1st and 3rd) using a uniform crossover.
2. Suppose the new population consists of the six offspring individuals received by the crossover operations in the above question. Evaluate the fitness of the new population, showing all your workings. Has the overall fitness improved?
3. By looking at the fitness function and considering that genes can only be digits between 0 and 9 find the chromosome representing the optimal solution (i.e. with the maximum fitness). Find the value of the maximum fitness.

Task 3



The starting position of a simple game. Player A moves first. The two players take turns moving, and each player must move his token to an open adjacent space in either direction. If the opponent occupies an adjacent space, then a player may jump over the opponent to the next open space if any. (For example, if A is on 3 and B is on 2, then A may move back to 1.) The game ends when one player reaches the opposite end of the board. If player A reaches space 4 first, then the value of the game to A is +1; if player B reaches space 1 first, then the value of the game to A is -1.

Consider the two-player game described above in the figure.

- a. Draw the complete game tree
- b. Run minimax and alpha beta pruning algorithms on it.