# Multiple-Choice Questions (Difficulty: Hard)

1. In the context of AI, which algorithm uses a heuristic to estimate the cost from the current node to the goal and is used for pathfinding in state space search?

A) Greedy Best-First Search

B) Uniform Cost Search

C) A\* Search

D) Depth-First Search

\*\*Answer: C) A\* Search\*\*

2. What is a key characteristic of admissible heuristics in informed search algorithms?

A) They guarantee that the shortest path will be found.

B) They potentially overestimate the cost to reach the goal.

C) They never underestimate the cost to reach the goal.

D) They never overestimate the cost to reach the goal.

\*\*Answer: D) They never overestimate the cost to reach the goal.\*\*

3. Which of the following is NOT true about Genetic Algorithms?

A) They utilize crossover and mutation to generate new solutions.

B) They guarantee finding the global optimum.

C) They evolve a population of solution candidates over time.

D) They often start with a randomly generated population of solutions.

\*\*Answer: B) They guarantee finding the global optimum.\*\*

# True/False Questions (Difficulty: Medium)

1. True or False: In Greedy Best-First Search, expanding the node that appears closest to the goal guarantees finding the shortest path to the goal.

\*\*Answer: False. Greedy Best-First Search does not guarantee the shortest path as it may choose paths that seem closer to the goal but lead to longer routes overall.\*\*

2. True or False: The A\* search algorithm's completeness and optimality depend on whether the heuristic used is admissible.

\*\*Answer: True. The A\* search algorithm is complete and optimal if the heuristic is admissible, meaning it never overestimates the true cost to reach the goal.\*\*

3. True or False: Alpha-beta pruning can reduce the number of nodes evaluated by the Minimax algorithm without affecting the outcome.

\*\*Answer: True. Alpha-beta pruning cuts off branches that cannot affect the final decision, thus optimizing the search process without changing the result.\*\*

4. True or False: Local Search Algorithms always maintain a search tree to explore solutions.

\*\*Answer: False. Local Search Algorithms do not maintain a search tree but instead operate by iteratively improving a single solution.\*\*

5. True or False: Genetic Algorithms are always more efficient than other optimization algorithms in finding the best solutions.

\*\*Answer: False. The efficiency of Genetic Algorithms can vary based on the problem and the specific implementation details; they are not always the most efficient method.\*\*

# Short Answer Questions (Difficulty: Hard)

1. Explain the role of the evaluation function in the Minimax algorithm.

\*\*Answer: The evaluation function in the Minimax algorithm assesses the desirability of a game's terminal states from the perspective of the maximizer. It helps determine the best possible moves by simulating different outcomes and choosing the one that maximizes the player's minimum gain against an optimal opponent.\*\*

2. Describe how Alpha-Beta pruning enhances the Minimax algorithm.

\*\*Answer: Alpha-Beta pruning enhances the Minimax algorithm by eliminating branches in the search tree that do not affect the final decision. This reduces the number of nodes evaluated, which can significantly decrease computation time and resource usage, allowing the algorithm to search deeper within the same time constraints.\*\*