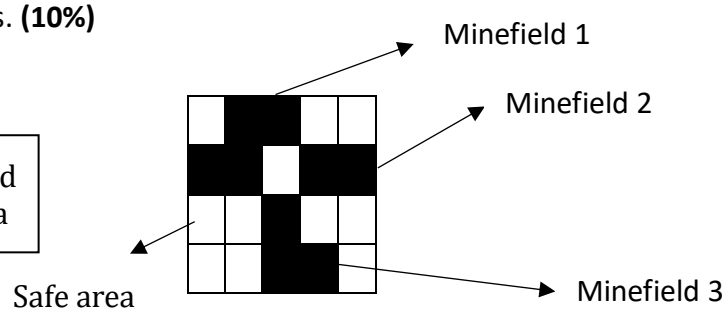
Algorithm Design & Analysis – Extra assignments

1. Please solve Traveling Salesman Problem (TSP) by using Ant Colony Optimization (ACO), Dynamic Programming (DP), and Branch and Bound(B&B) algorithms.
   - **Travelling Salesman Problem (TSP):** Given a set of cities and distance between every pair of cities, the problem is to find the shortest possible route that visits every city exactly once and returns to the starting point.
   - The attached file(cities.txt) is the coordinate of 20 cities.
   - Explain the design concept of ACO, DP, and B&B for the problem. **(9%)**
   - Pseudocode of ACO, DP, and B&B for the problem. **(9%)**
   - Implement algorithms for the problem. Please upload your code to e-learning. **(20%)**
   - Analyze the complexity of your algorithms. **(6%)**
   - Please further compare these three algorithms and analyze the complexity, computation time (running time), and results. Explain reasons which algorithm is suitable for solving the TSP problem. **(6%)**
2. Please design an algorithm to solve the TSP problem. The running time of your algorithm is less than ACO and the result is better or equal to ACO.
   - Implement algorithms for the problem. Please upload your code to e-learning. **(20%)**
3. Given a map, there are minefields and safe areas on the map. Find the largest minefield on the map and return its area. If there are no mines on the map, 0 is returned.
   - Pseudocode of your algorithms. **(10)**
   - Implement algorithms for the problem. Please upload your code to e-learning. **(10%)**
   - Analyze the complexity of your algorithms. **(10%)**

   Input: map =[
   [0,1,1,0,0]
   [1,1,0,1,1]
   [0,0,1,0,0]
   [0,0,1,1,0]
   ]

   $\begin{cases} 1 & \text{, minefield} \\ 0 & \text{, safe area} \end{cases}$

   Output: 4

   Explanation: There are three minefields on the map. Their areas are 4, 2, and 3. The maximum area is 4, so return 4.