CSE422: Artificial Intelligence
Brac University

A.

Object	Reward	Weight
A	20	1
B	5	2
C	10	3
D	40	8
E	15	7
F	25	4
G	4	5
H	7	2

Maximum weight = 12

The above problem is a 0/1 Knapsack problem. You have to carry the different objects in your bag in a way such that the reward is maximized without exceeding the weight limit. You can carry an object exactly once but you always have to carry the object labeled "H". Assuming you are asked to use Genetic Algorithm for this problem, answer the following questions

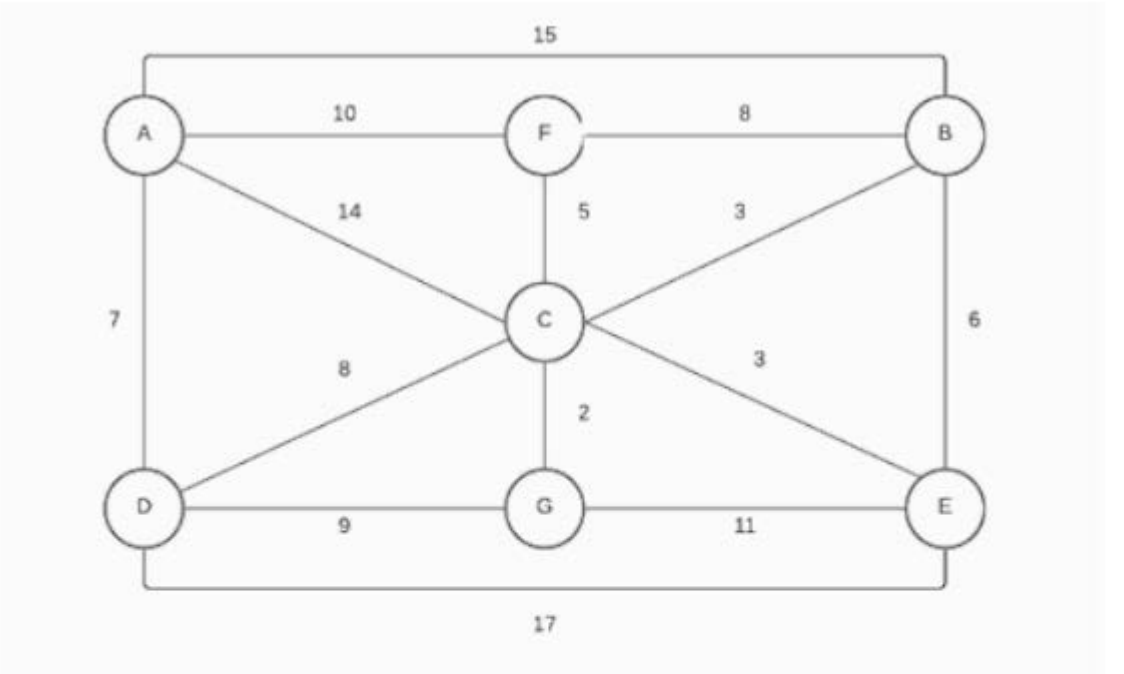
1. Encode the problem and create an initial population of 4 different chromosomes

2. Explain what would be an appropriate fitness function for this problem. Use the fitness function and perform natural selection to choose the 2 fittest chromosomes.

3. Using the selected chromosomes perform a single-point crossover to get 2 offspring.

4. Perform mutation and check the fitness of the final offspring. Explain your work.

B.



This is a map of 7 cities (A, B, C, D, E, F, and G) that are connected with each other via different paths. Your job is to visit every city just once covering the minimum distance possible. You have to find the optimal combination of cities using the Genetic Algorithm. You can start at any point and end at any point but keep in mind that every city must be visited.

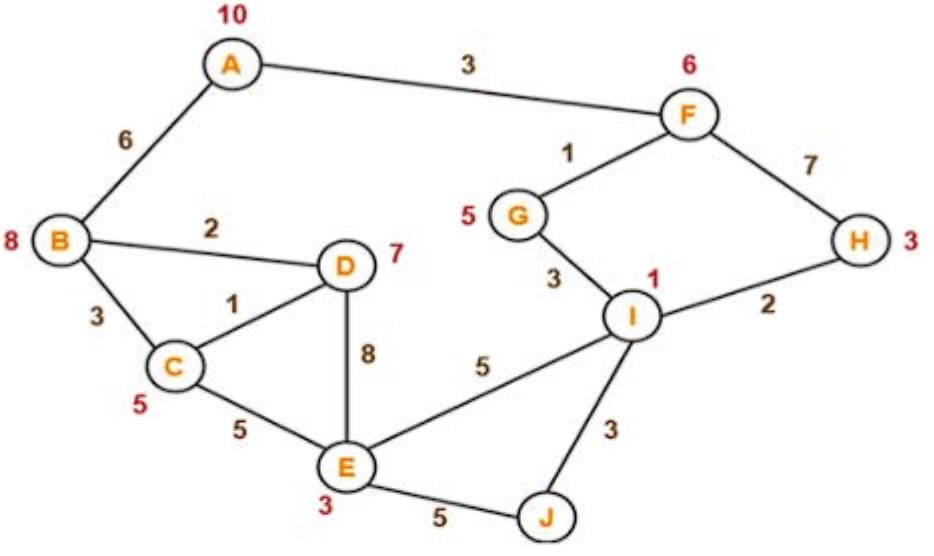
1. Encode the problem and create an initial population of 4 different chromosomes.

2. Using an appropriate fitness function, perform natural selection to choose the 2 fittest chromosomes.

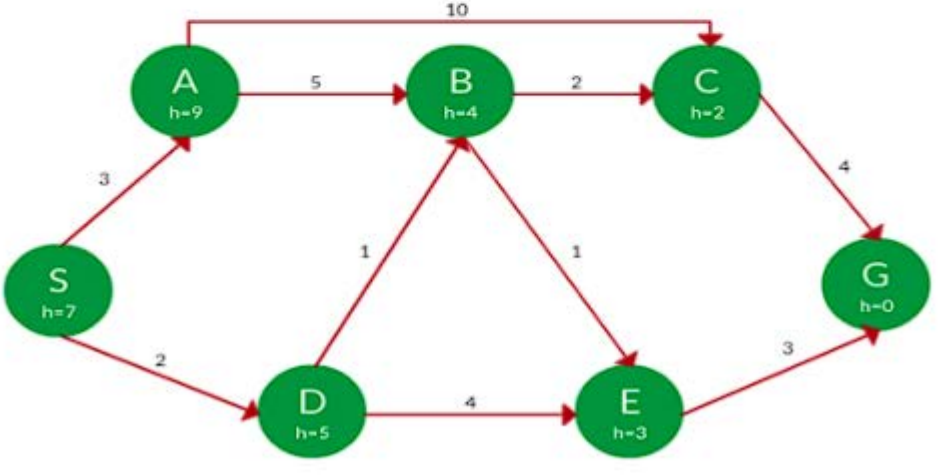
3. Perform single point crossover from the 3rd index of your selected chromosomes to get 2 offspring. Are they eligible as a solution? If not, explain with reason.

4. Would the usual method of mutation work here? Explain your opinion.

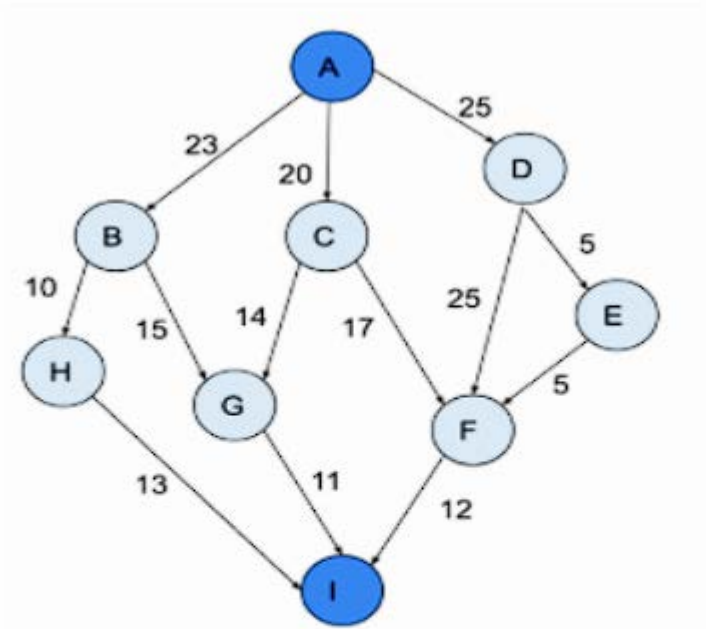
C. Apply A* search and Greedy Best First Search on the given graph to find the optimal path and the cost of the optimal path. The values in RED represent the heuristic values for each node.



D. Apply A* and Greedy Best First Search on the given graph to find the optimal path and the cost of the optimal path.



E.



1. For the given state space graph, assign heuristic values to each node such that the heuristic values are consistent.
2. For the given state space graph, assign heuristic values to each node such that the heuristic values are admissible.
3. For the given state space graph, assign heuristic values to each node such that the heuristic values are admissible but not consistent.