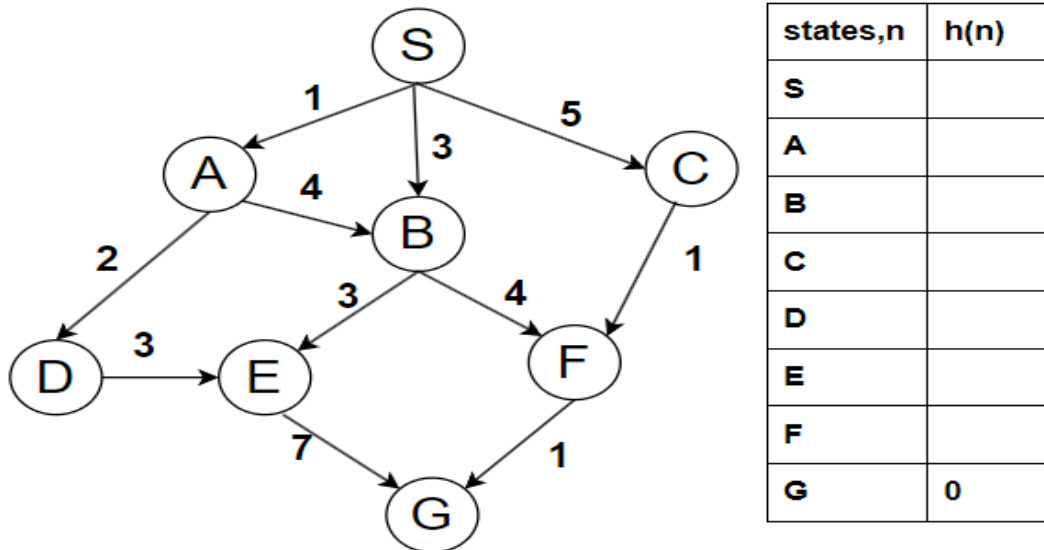


**BRAC UNIVERSITY**  
**Department of Computer Science and Engineering**  
**CSE 422: Artificial Intelligence**  
**Assignment -01**

**Question-01**

**A.** For the following state space tree define the heuristic values for the following states such that it is admissible.

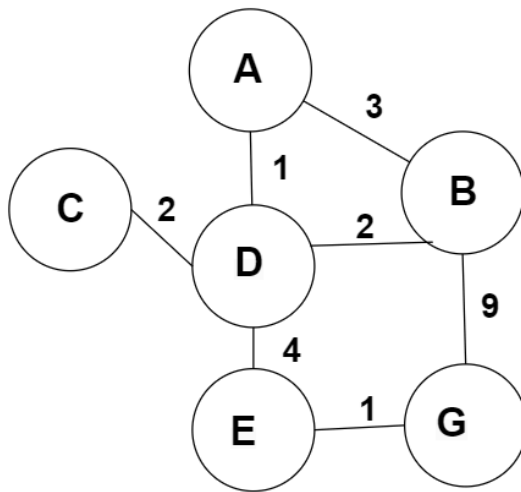


**B.** Perform Best First Search and A\* search algorithm on the following graph with the defined heuristic values.

**C.** Now comment on the heuristic values defined whether it is consistent or no by showing the calculations needed. And correct the heuristic values to be consistent.

**D.** For a state, from which the goal node is unreachable, what do you think the actual path cost and heuristic value should be?

### Question-02



Nodes,n	$h_1(n)$	$h_2(n)$
A	4	5
B	6	6
C	4	5
D	3	4
E	1	1
G	0	0

- A) From the above context, please explain briefly which heuristic function would be better?
- B) Now after choosing the heuristic, perform A\* Search
- C) Demonstrate if the chosen heuristic is consistent or not.

### Question-02

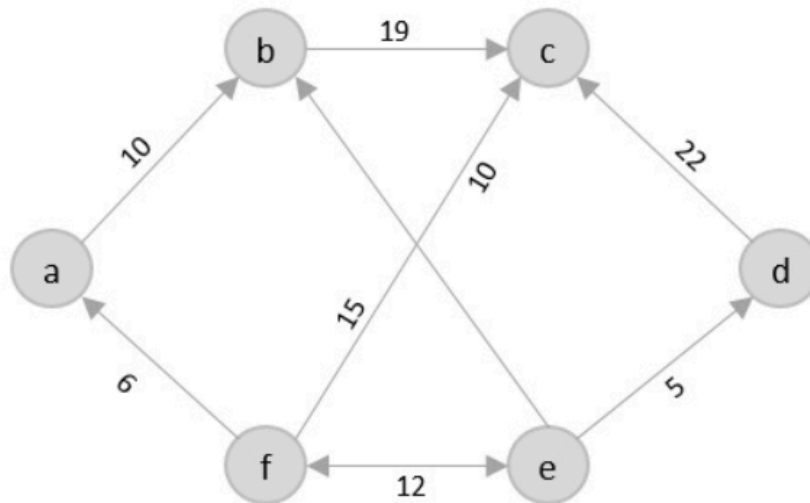
- A. What are the properties of Local Search? For what kind of problems can we find Local Search useful?
- B. Some examples of Local Search Algorithms
- C. What are the drawbacks of Hill Climb Search and its Remedies
- D. Demonstrate the drawbacks Local Maxima and Plateau of Hill-Climb Approach using 8-Puzzle
- E. What are the key steps of simulated annealing?
- F. How is the concept of probability implemented in Simulated annealing?
- G. What is the relationship between Temperature and the probabilistic value  $e^{\{-\Delta E/T\}}$ ?

### Question-03

- A. What is Elitism in Genetic Algorithm and what could be the impact on the algorithm?
- B. What is a Single Point Crossover and Two-point crossover? Show with an example
- C. What are some stopping conditions Genetic Algo may implement?
- D. Importance of Mutation in Genetic Algo?

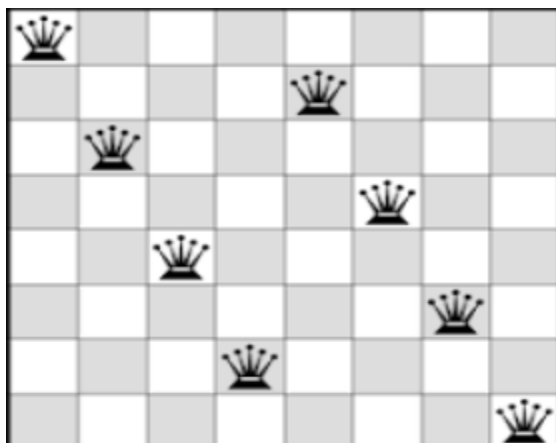
**Question-04 (for this problem, assume the edges to be bidirectional)**

The Traveling Salesman Problem (TSP) is a classic optimization problem. Where the goal is to find the shortest possible route that visits each city exactly once and returns to the starting city given a set of cities (a, b, c, d, e and f) and their path cost.



- Construct a population of 4 chromosomes, define fitness function.
- Select the best two chromosomes using the **Roulette Wheel Selection** or **RankBased** method.
- Now perform **Uniform Cross Over** and **Two-point Crossover** to create a total of 4 children.
- Perform mutation making sure the chromosomes are still eligible
- Calculate their fitness

**Question-05**



Following is 8-Queen board, now simulate Genetic Algorithm for the 8-Queen board.

- Construct a population of 4 chromosomes, define fitness function.
- Select two chromosomes for crossover using natural selection
- Now perform a **Single Point Crossover** to create a total of 4 children.
- Perform mutation
- Calculate their fitness

**Question-06**

Perform Alpha-Beta Pruning on the following state space tree, and find the state value, alpha and beta values for all the nodes.

