BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Semester Midterm — Semester :Summer 2023
Duration: 1 Hour 30 Minutes — Full Marks: 40

CSE 422: Artificial Intelligence

Answer the following questions.
Figures in the right margin indicate marks.

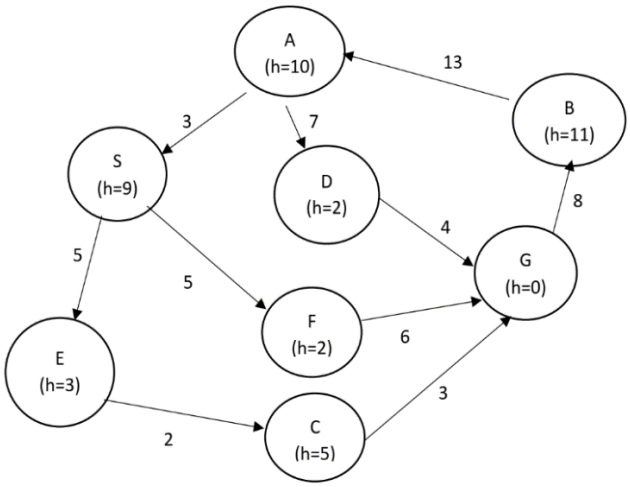
Name:	ID:	Section:

1. CO1 a. **Explain** how and under what scenarios can Simulated Annealing overcome the drawbacks of traditional hill climbing. 4

b. **Explain** briefly with reasoning which of the following statements are true or false: 3
-When $\Delta E = 0$, then Simulated Annealing may have come across a plateau
-Genetic Algorithm can jump between different states of a state space
-The value of $e^{\Delta E/T}$ ranges from positive to negative infinity. .

c. Assume 123456 and 789325 represent two chromosomes. **Explain** how you will perform single point crossover and mutation to create 2 new offspring. (crossover from the middle and you can mutate only 1 gene) 3

2. CO1 a. **Modify** heuristic values of some of the nodes of the following graph so that all the heuristics values of all the nodes become consistent where A is the start node and G is the goal node 5



b. **Perform** A* search to go from the initial state to goal state in an 8-puzzle problem. Avoid repeated states in your search 5

Initial State

1	3	6
4	2	
7	5	8

Goal State

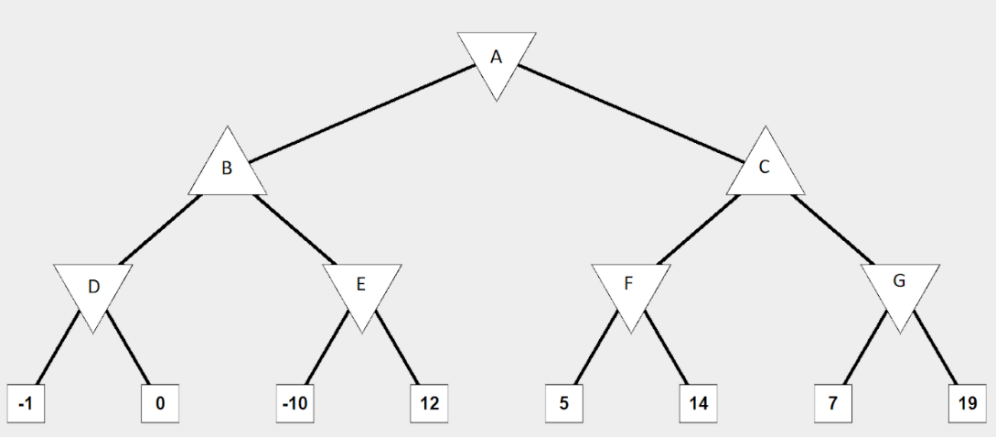
1	2	3
4	5	6
7	8	

3. CO2

a. Your job is to create a palindromic positive integer of length n. The number will have no leading zeros. The digit 7 can occur only in the odd positions starting from the left. And the sum of the digits cannot exceed 6n. Now answer the following questions:
-**Define** the variables here
-**Define** the domain of the variables
-What are the constraints? **List** them all. 6

b. Briefly **discuss** the heuristics used in variable ordering and value ordering while optimizing backtracking to solve Constraint Satisfaction Problems. 4

4. CO1



a. For the tree above, **find** the solution using min-max algorithm. Here {A, D, E, F, G} are moves of the minimizing player and {B, C} are the moves of the maximizing player. 4

b. **Find** the alpha and beta values for all the nodes if α-β pruning is run on this tree. Which nodes will not be explored after the said pruning? Which branches will be pruned? 6