Set 1

BRAC UNIVERSITY
Department of Computer Science and Engineering

Examination: Semester Midterm | Semester: Spring 2023
Duration: 1 Hour 30 Minutes | Full Marks: 40

CSE 422: Artificial Intelligence

Answer **any 4 out of 5** from the following questions.
Figures in the right margin indicate marks

Name:	ID:	Section:

1. CO2 Suppose you have an equation f(x) = x2 - 5x + 6. Assume x can be any number between 0 to 15. Now your job is to find an appropriate value of x such that the value of f(x) = 0 using Genetic Algorithm

a. Consider the fact that every chromosome will have 4 genes, **illustrate** an appropriate encoding technique to create an initial population of 4 randomly generated chromosomes. 3

b. Using an appropriate fitness function **deduce** the 2 fittest chromosomes and perform a single pointer crossover from the middle to create two offspring. 3

c. **Explain** how you can mutate the offspring derived from (B) and comment on the fitness of the final produced offspring. 2

d. **Explain** your opinion on whether Genetic Algorithm can be treated as a class of Local Search Algorithms or not. 2

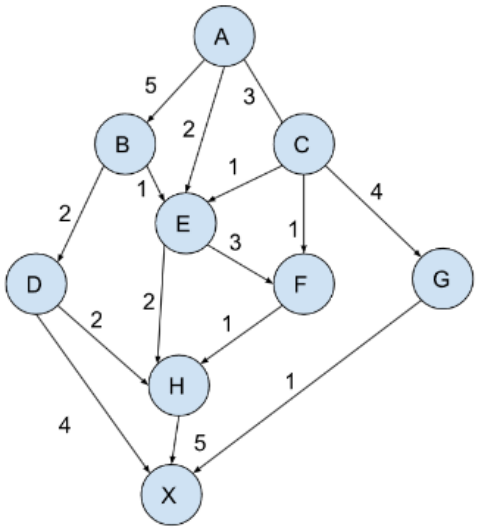
2. CO1

a. **Define** the differences between a utility function and a goal function. 3

b. **Define** the differences between rational behavior and human like behavior. 3

c. In your mobile, you have downloaded a bot that can provide beauty tips through texts after you take a selfie of your face. **Define** the PEAS of this application agent. 4

3. CO2



Node	h-Value
A	7
B	5
C	6
D	3
E	4
F	4
G	2
H	2
X	0

In the above graph, node A is the source, and node X is the destination. The arrows indicate directed edges. The table contains the heuristic values of each node. Now answer the following:

a. **Apply** A* algorithm to find the path from the source to the destination. Show the steps. In case, you end up with multiple nodes with f(n) = g(n) + h(n), then you can break the tie by choosing the lexicographically (alphabetically) smaller node. Suppose, node C and node D has the same f(n), in that case, choose C. 6

b. Is the heuristic consistent? Why or why not? **Explain** with appropriate calculation. 4

Set 1

4. CO2

a. **Define** Local maxima. 1

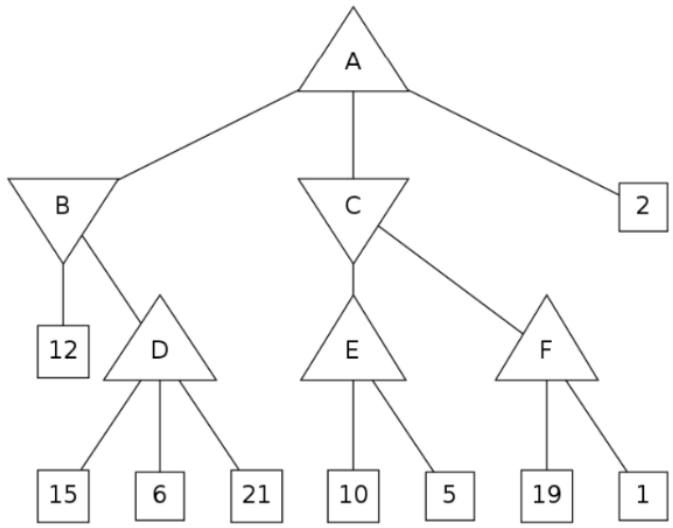
b. **Define** Local maxima in terms of 8 puzzle game 2

c. Imagine you are facing Local Maxima, now **explain** how Random Restart will solve this problem 4

d. **Discuss** the significance of Temperature variable in Simulated Annealing algorithm in your own words 3

5. CO4

Assuming the upward-facing triangles stand for the maximizing player and downward-facing triangles represent the minimizing player, run min-max algorithm on the following tree and find the values for each node from A to F. 3



a. What path from the root node A will be returned by the min-max algorithm? **State**. 1

b. What will be the alpha- and beta- values of each node in this tree if alpha-beta pruning is run on this tree? Also, **illustrate** the crossed-out branches that would be pruned by alpha-beta pruning. 4

c. For the game tree below, **identify** the minimum value of x for which the marked branch will be pruned by alpha-beta pruning. Here, again assume that upward-facing triangles stand for the maximizing player and downward-facing triangles represent the minimizing player. 2