BRAC UNIVERSITY
CSE422 : Artificial Intelligence
Fall 2025

Duration: 30 minutes **Quiz 2** **Total: 15 marks**

Name: **ID:** 0.5 Points

Section: 0.5 Points

Given N consecutive numbers, you are to **use the genetic algorithm to find an order** such that the sum of the numbers at even positions is equal to the sum of the numbers at odd positions. In addition, a solution is considered invalid if it contains any number more than once.

a. Write whether the following chromosomes are valid or not: (2 Points)

[2,4,3,5,4] : Invalid.

[1,7,4,3,5] : Invalid.

[2,4,3,6,5] : Valid.

[5,6,8,9,7] : Valid.

b. Write an equation for calculating the fitness of a chromosome for the given problem. You must create the equation in such a way that **worse chromosomes are assigned lower values.** [Note: You may assume the variables S_{Even} to be the sum of the numbers at even positions and S_{Odd} to be the sum of the numbers at odd positions.] (2 Points)
Answer: $f = -|S_{Even}-S_{Odd}|$

c. Calculate the fitness of the following chromosome [5, 4, 7, 6, 8] using the equation you created in question (b). (1 Point)
Answer: -10

d. Write the name of a crossover technique that forms **only valid chromosomes** for the given problem. (1 Point)
Answer: Order Crossover.

e. Write the set of chromosomes that will be formed using the crossover technique in question (d) from the following set of chromosomes: [3,4,2,5,6,8,7], [7,5,2,8,4,6,3]. (4 Points)
Answer: Choose a point randomly. Then, perform any variant of Order Crossover.

f. Write the name of a mutation technique that forms **only valid chromosomes** for the given problem. (1 Point)
Answer: Swap Mutation.

g. Write the set of chromosomes that will be formed using the mutation technique in question (f) from the following set of chromosomes: [3,4,2,5,6], [8,5,9,7,4,6,3], [2,4,6,5,3]. (3 Points)
Answer: Choose two points randomly. Then, swap the values of the chosen indices.