Date of Submission: Feb 14, 2023 (At the beginning of our class)

1. Let S and T be character variables such that
S = 'WE THE PEOPLE'
T = 'OF THE BANGLADESH'
Find the length of S and T.

A = SUBSTRING(S, 8, 6)
B = INSERT(A, 7, 'BGDXY')
C = DELETE(B, 11, 2)
D = REPLACE(C, 'BGD', T).
Find the values of A, B, C, and D with complete explanations.

2. (a) For each of the following patterns P and texts T, find the number of C comparisons to find the index of P in T by applying the First Pattern Matching algorithm.

I. P = abc, T = $(cbab)^{10}$
II. P = bac, T = $a^2c^5b^3acaa$
III. P = abc, T = $(bbaac)^4$

(b) Find the table and corresponding graph for the Second Pattern Matching algorithm where the pattern is P - aabaa and text T = aaabacaabaabca.

3. Suppose A is the following list of 10 numbers:
67, 23, last three digits of your ID, 2, 77, 12, 99, 45, -3, 48

I. Use the **bubble sort** algorithm to sort A in step by step.
II. Use the **merge sort** algorithm to sort A in step by step.
III. Use the **insertion sort** algorithm to sort A in step by step.
IV. Use the **selection sort** algorithm to sort A in step by step.

4. Consider the following multidimensional arrays: AX(-5:5, 3:33) BY(4:10, 2:15, 12:22)

I. Find the length of each dimension and the number of elements in AX and BY.
II. Suppose Base(BY) = 500 and there are w = 4 words per memory location. Find the effective indices E1, E2, E3 and the address of BY[6, 15, 18] assuming BY is stored in row-major order.

5. Suppose A is the following list of 10 numbers:
67, 23, 200, 77, 12, last three digits of your ID, 99, 45, -3, 48

Use linear search to find the last digit of your ID.

6. Consider the following list = [3, 4, 5, 7, 8, 9, 10, 12, 14, 15, 16, 20, 21, 25, 35, 40, 45, 60, 65, 90, 100, 200]. Between linear search and binary search, which searching algorithm would be best to apply to find the item 40 from the list? Show step-by-step procedure to find the desired item (40) utilizing the applicable searching algorithm.