

Assignment 4

1. (Multiple choice) Which of the following statements is/are **NOT** true? [2 points]

- A. NP is the class of languages that are not decidable in polynomial time on a deterministic single-tape Turing machine.
- B. An algorithm is an ordered set of unambiguous, executable instructions that defines a terminating process for solving some vague computational problems.
- C. For a correct algorithm, it will halt and report the invalidity of input for invalid input instance and for valid input instance, it will halt and output correct result.
- D. There are three primary control structures in algorithm: sequential execution, conditional branch, decision.
- E. The goal of using pseudocode is to consider the issue of algorithm development and representation without confining our decision to a particular programming language.

2. Read the pseudocode of the bubble sort and answer the question.

/* A is an array which index starts from 1 to A.length

Array, like [1,2,3,4,5], is one of the data structures.

The key point of array is that it can be accessed by index.

For example, A[i] means the ith number in array A.

We can get or change values in array by its index. */

procedure Bubble-Sort(A)

 for i := 1 to A.length-1

 for j := 1 to A.length - i

 if A[j] > A[j+1] then interchange A[j] and A[j+1]

a. After the sorting, the array A will be _____ (increasing/decreasing) order. [1 points]

b. For each pass, we guarantee one element in the correct position. For an array A, where A.length = 2021, after sorting how many passes have been executed ? [1 points]

c. When array A is [3,2,4,1,5], show the result array after each pass. [2 points]

3. Read the pseudocode of sequential search algorithm in sorted list (ascending order) and then show the flowchart of it. **[2 points]**

The sequential search algorithm in pseudocode:

procedure Search (SortedList, TargetValue)

if (SortedList empty)

then

 (Declare search a failure)

else

 (Select the first entry in SortedList to be TestEntry;

while (TargetValue > TestEntry and there remain entries to be considered)

do(Select the next entry in List as TestEntry);

if (TargetValue = TestEntry)

then (Declare search a success)

else(Declare search a failure)

)**end if**

4. Construct a finite-state automaton that recognize the set $(100)^*101(10)^*$. **[2 points]**