Anhui University of Science and Technology

2021~2022 Academic Year: Second Term International Postgraduate Exam Paper Course Title: Algorithm Analysis and Design Exam Type: Close-book Paper Type: A

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Binding Line

	I	II	III	IV	V	VI	VII	VIII	IX	X	Total Score
Standard Score	20	20	25	25	10	-	-	-	-	-	100
Score											

I. (20 Points) In what aspects and how do we judge the performance of an algorithm?

The efficiency of an algorithm can be computed by determining the amount of resources it consumes. The primary resources that an algorithm consumes are:

- Time: The CPU time required to executed the algorithm.
- Space: The amount of memory used by the algorithm for execution.

The lesser resources that an algorithm uses, the more efficient it is.

II. (20 points) Explain what recurrence is in a concrete example.

A recurrence relation is an equation that uses recursion to relate terms in a sequence or elements in an array. It is a way to define a sequence or array in terms of itself.

- Recurrence describes the running time of an algorithm that divides a problem of size n into a subproblems, each of size n/b, where a and b are positive constants. The subproblems are solved recursively, each in time T(n/b).

III. (25 points) Explain the data structure of LinkedList and how to insert/delete a node to/from a list.

A Linkedlist consist of a data structure when it comes to handling dynamic data elements known as node. Each node consists of two fields: one field has data and the second field has an address that keeps a reference to the next node.

Methods to insert a new node in linkedlist:

- → At the front of the linked list
- → After a given node.
- → At the end of the linked list.

To delete a node from the Linked list, we need to do the following steps:

1) Find the previous node of the node to be deleted.
2) Change the next of the previous node.
3) Free memory for the node to be deleted.

IV. (25 points) List two sort algorithms, explain how they work, and make a comparison between them.

Quick Sort: It works by breaking an array into smaller ones and swapping the small one depending on a comparison with the pivot element picked.

Bubble Sort: it compares two adjacent elements and swaps them until they are not in the intended order.

Compare:

Quick sort: compares element of partition the unsorted array two different halves around the pivot value
→ $O(n^2)$ but it works very fast in $O(n\log n)$ time complexity on average

Bubble Sort: compare elements to place the max elements to the and positions.
→ $O(n^2)$ sorting time complexity.

V. (10 points) Make a comment on this course.

→ First of all I would like to appreciate my teacher for providing all the materials for this course and very clear explanations during class time.

→ I have managed to gain a number of benefits and the best benefit I received is in the development of the procedure itself, which involves identification of the processes, major decision points and variables necessary to solve a problem.

→ My decision making have become more rational when dealing with algorithms.

→ The knowledge I have gained from this course is helpful to a greater extend, now I will use it for my thesis preparation