



EASTERN UNIVERSITY, SRI LANKA

DEPARTMENT OF MATHEMATICS

EXTERNAL DEGREE EXAMINATION IN SCIENCE -2005/2006

SECOND YEAR FIRST SEMESTER (MARCH/MAY-2010)

EXTCS 201 –DATA STRUCTURES AND DESIGN OF ALGORITHM

Answer all question

Time allowed: 02 Hours

1.

Define and implement **ADT Stack** and **ADT Queue** data structures. Use linked list to represent the list of elements.

(40 Marks)

Write a C++ program that reads an integer number and verify whether the input is palindrome using stack and queue data structures defined above.

(60 Marks)

2.

Describe **Bubblesort** and **Mergesort** algorithms to sort a list of numbers.

(40 Marks)

Trace the above sorting algorithms for the following list of numbers:

- | | | | | | | |
|----|----|----|----|----|----|---|
| a) | 1, | 1, | 1, | 1, | 1, | 1 |
| b) | 1, | 2, | 3, | 4, | 5, | 6 |
| c) | 9, | 8, | 7, | 6, | 5, | 4 |
| d) | 5, | 8, | 3, | 7, | 1, | 2 |

Compare their performances.

(4 X 15 Marks)

3.

- i. Give three Asymptotic Notations and their definitions.
- ii. Show: $f(n) = 2n^7 - 6n^5 + 10n^2 - 5 = O(n^7)$ and state the reasons for this.
- iii. What is the complexity of this C++ code?

```
1)   cin >> n;                               // Same as: n = GetInteger();
2)   for (i = 1; i <= n; i ++)
```

for (j = 1; j <= n; j ++)

```
4)       A[i][j] = 0;
5)   for (i = 1; i <= n; i ++)
```

A[i][i] = 1;

- iv. Explain binary search algorithm with an example.

(4 X 25 Marks)

4.

- i. What are the two main measures for the efficiency of an algorithm?
- ii. Name a “non linear data structure” and a “linear data structure”?
- iii. Why do the elements of an array are stored successively in memory cells?
- iv. How do general list differ from special list such as stacks and queues?
- v. Name a Data Structure with node has pointer to previous node and next node“?
- vi. Dummy node at the beginning of the linked list is called head node. What is the purpose of the head node?
- vii. Let S be a nonempty stack .Suppose an item is first popped and, then pushed back to S, resulting in S1. Is always S1=S (True or False)?
- viii. Let Q be a nonempty First In First out (FIFO) queue. Suppose an item is First dequeued (removed) and enqueued (inserted) into the queue Q , resulting in Q1 Is always Q1=Q (True or False)
- ix. Name two sorting methods that use Divide and Conquer algorithm.
- x. What is the advantage of using circular queue than normal queue?

(10 X 10 Marks)