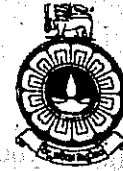


The Open University of Sri Lanka  
B.Sc Degree Programme – Level 04  
Final Examination – 2007/2008  
CSU 2279 – Data Structures and Algorithms – Paper I

Duration: Two and Half hours

Date: 07<sup>th</sup> July 2008



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Time: 10.00 a.m – 12.30 p.m

Answer Four Questions Only.

Q1.

- What are the factors that the running time of a program depends on?
- Using examples, explain the following terms briefly.
  - Best – case running time.
  - Average – case running time.
  - Worst – case running time.
- What are the two measurements of the growth rates of algorithms? State the difference/s between them.
- Let A and B be two algorithms for a task with time complexities  $O(n^2)$  and  $O(n^3)$  respectively. For a particular compiler machine combination, A and B takes  $2000n^2$  and  $20n^3$  milliseconds respectively for successful completion. Identify the most suitable algorithm for the each situation with respect to the size of the data set..

Q2.

- State whether the following statements are **True** or **False**.
  - An algorithm should be executed within a finite amount of time.
  - ADT and Integer are examples for simple data types.
  - Linear Insertion Sort* is an example for sorting by exchange.
  - The dominant factor of Internal Sorting is the number of comparisons and exchanges.
  - The running time of a sequence of statements is determined by the sum rule.
- Calculate the running time of the following functions.
  - Function fact (i:integer): integer;  
var  
    x: integer;  
begin  
    fact := 1;  
    for x := 1 to i do  
        fact := fact \* i;  
end;
  - Function recursive (n:integer):integer;  
begin  
    if n<=1 then  
        recursive := 1  
    else  
        recursive := n+recursive(n-1)  
    end;
- Give two instances where the Queue structure is used.
  - Give two instances where the Stack structure is used.

Q3.

- a). i). What do you mean by the term " *Algorithm* " ?  
ii). What do you mean by the term " *Recursive Algorithm* " ?
- b). i). Write an ADT to store the dimensions of a square. (eg. length, width)  
ii). What are the necessary modifications to the above ADT, if you need to store the dimensions of a cuboid. Write a function to calculate the volume of the cuboid.  
iii). Write a recursive function to print the volume of the cuboids when the dimensions are varying between 1-5. ( Dimensions varying in equal units. For example, in the first time all dimensions are 5, secondly all are 4 and so on.)

Q4.

- a). What are the dominant factors of internal and external sorting methods ?
- b). Create an ADT to store marks of CSU2279 students. The ADT should consist of student's name, index no and marks obtained. Assume there are 70 students in the class.
- c). Write a procedure to display the result sheet in the ascending order of marks.
- d). Write a procedure using the *Binary Search* algorithm to find the mark of the student for a given index number.

Q5.

- a). i). What are the differences between the *straight sequential search* and the *binary search* ?  
ii). What are the three kinds of variations of sequential searching methods ?
- b). Write a procedure using the *Straight sequential search* method to find the number of students, who have scored greater than 70 marks for a subject. State clearly the assumptions you make.
- c). Write a program to input 50 employee's name and NID no into an array and sort them into the alphabetical order using the *Bubble sort* algorithm.
- d). Explain how the Linear insertion sort works on the following set of characters when it is sorted into the alphabetical order.

D E G R E E.

Q6.

- a). Compare and contrast the *Straight selection sort* algorithm and the *Quick sort* algorithm in terms of their respective running times.
- b). What are the strategies used by each of the sorting algorithms stated in a) for their sorting processes ?
- c). "Quick sort is a fast sorting algorithm than straight selection sort" . Do you agree with this statement ? Justify your answer.
- d). Explain how the *straight selection sort* works on the set of characters given below when it is sorted into the reverse alphabetical order.

COMPUTER.

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