



**RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES**

**B.Sc. (Information and Communication Technology) Degree
First Year - Semester II Examination – November/December 2016**

ICT 1305 – DATA STRUCTURES

Time: Three (3) hours

Answer All questions

1.
 - a. Explain how a selected data structure affects on the performance of a program. (05 marks)
 - b. Explain how to compare two algorithms asymptotically. (05 marks)
 - c. An array can be used as a building block of some data structures. Discuss the advantages and disadvantages of using arrays in data structures with examples. (04 marks)
 - d. Suppose there are a fixed number of trains and each train has a variable number of compartments. A compartment has a grade and a seating capacity. Suggest a suitable data structure to store these data and pictorially illustrate how to use it. (06 marks)

2.
 - a. Explain the advantages and disadvantages of constructing a list using dynamic nodes. (04 marks)
 - b. A programmer is asked to write a program to record customers' meter readings of a certain utility provider. The program should support to record 12 readings (for 12 months) of each customer. The meter reading should be stored in ascending order of customer's account number.
 - i. Suggest a suitable structure to record customer data.
 - ii. Implement an insert method to add a new customer.
 - iii. Implement a method to update the meter reading of a given month of a certain customer. (10 marks)
 - c. Implement a method to calculate the average number of units consumed by a customer per month in above b. using C/C++. (04 marks)
 - d. Write a pseudo method or C/C++ method to remove an element in above b. (02 marks)

- 3.
- List four applications of stacks. (02 marks)
 - Rewrite the following expressions in both prefix and postfix notations,
 - $A+B* C+(G*C-E/F)^2-H$
 - $(A-B/C)*(D^2-E)/F+G$ (04 marks)
 - Explain the steps of evaluating a postfix expression using a suitable data structure. (06 marks)
 - Illustrate how to evaluate the postfix expression **a2/bcd+e-*fg*++** using above c. (04 marks)
 - Design required structures to implement doubly circular linked list using C/C++. (04 marks)
- 4.
- Explain how to overcome space wastage in implementing queues using arrays. (04 marks)
 - Discuss how queues are utilized in computer operating systems. (03 marks)
 - Implement an array based queue structure and dequeue() operation. (04 marks)
 - What do you mean by the stability of a sorting algorithm? Explain using an example. (02 marks)
 - Compare and contrast the two sorting techniques: selection and merge. (02 marks)
 - Run through the selection sort algorithm by hand on the list 4, 1, 3, 2, 7, 6. (02 marks)
 - Write a C/C++ function to sort an array of integers using selection sort algorithm. (03 marks)
- 5.
- Write the recursive definition of the binary search tree (BST) structure. (02 marks)
 - Define the following terms with respect to BST,
 - Complete tree
 - Simple path
 - Siblings
 - Height
 (04 marks)
 - What are the cases that you have to consider when deleting a node of a BST? Explain using examples. (03 marks)
 - Write C/C++ code segment to delete a tree node with a single child. Assume that the node has already been located. (03 marks)
 - Compare and contrast BST and AVL trees. (03 marks)
 - What is/are the situation(s) that you have to perform double rotation operation in an AVL tree? Explain using examples. (03 marks)
 - Construct an algorithm to find the height of a tree node. (02 marks)

END