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THE NATIONAL UNIVERSITY OF IRELAND

NATIONAL UNIVERSITY OF IRELAND, GALWAY.

SEMESTER II EXAMINATIONS 1998/1999

Higher Diploma in Software Engineering
Second Electronic Engineering and Computing

CT853 Algorithmics and Logical Methods

Prof. D Bell
Dr G. Lyons
Mr. C. O' Riordan

Answer any 3 questions
All questions carry equal weight
Time Allowed: **TWO** hours

- Q.1** i) Compare arrays, linked lists and binary trees as representations for sorted lists. Outline an insertion algorithm for the three different data structures.
- ii) A queue may be described by the following operations:

Enqueue (Queue, item) -> Queue.
Dequeue (Queue) -> Queue.
Head (Queue) -> item.
Empty (Queue) -> Boolean.

Enqueue adds an item to the end of a queue.
Dequeue removes an item from the head of a queue.
Head returns the top item of a queue.
Empty returns a Boolean value indicating whether the queue is empty or not.

Using a circular array, give pseudo-code for the above operations.

- Q.2**
- i) The selection sort is a sorting algorithm that repeatedly finds the largest (or smallest) item and places it in the correct place. Write pseudo-code to implement the selection sort. Illustrate its operation with sample input.
 - ii) The MergeSort and QuickSort are two divide and conquer approaches to sorting. Outline *either* approach.
Compare and contrast the merge sort and quicksort algorithms.
 - iii) Given a set of 1000 student records containing fields, name, address, student number, and percentage obtained, develop an efficient algorithm to sort these records based on percentage obtained.
- Q.3.**
- i) AVL trees and B-trees are two approaches to maintaining balanced trees. Outline the operation of *either* approach. Show how the tree would expand given the following values:
19, 15, 23, 31, 35, 36, 67, 61, 7

(Assume B-tree order of 2)
 - ii) A company wishes to maintain a hash file to keep N employee records. It is assumed the number of employees is not going to change in the foreseeable future. Outline a hashing algorithm and collision resolution policy using the employee name as a hash field
 - iii) Outline a technique that allows hashing to a dynamically expanding or contracting file.
- Q.4.**
- i) Describe an algorithm to discover the shortest path between two nodes on a directed weighted acyclic graph.
 - ii) Compare the algorithms for breadth first and depth first search.
 - iii) Explain *Huffman encoding* and outline the algorithm used. Illustrate its operation.