



The Open University of Sri Lanka
 B.Sc Degree Programme – Level 04
 Final Examination – 2007/2008
CSU 2279 – Data Structures and Algorithms – Paper II
 Duration: Two and Half hours

Date: 08th July 2008

Time: 10.00 a.m – 12.30 p.m

Answer Four Questions Only.

Q1.

- a). Assume that there is no simple data type in your pascal version to represent character strings. Describe a suitable data structure to implement character strings in this pascal version and write pascal procedures/functions to implement the following string operations.
- i). CONCAT (s1,s2,s3) : Concatenates S1 and S2 and the result will be in S3.
 ii). POS (s1,s2) : Returns the starting position of S1 in S2.
- b). i). Give the type definition for the *set* structure using the sequential bitstring representation.
 ii). Write procedures/functions to implement the following set operations.
- A. INISET (s) : Initializes the set.
 B. UNISETS (s1,s2) : Creates the union of the two sets, S1 and S2.

Q2.

- a). Give the type definition of a singly linked list data structure to store the index number and marks for two subjects of a student. How do you extend this to a doubly linked list structure.
- b). With the aid of appropriate diagrams, distinguish between the array based implementation and the pointer based implementation of the list data structure.
- c). Write suitable procedures/functions for the following singly linked list data structure operations.
 i). Insert an element prior to a given element
 ii). Count the number of occurrences of a given element.
- d). Write a program to check whether the given two lists are identical.

Q3.

- a). Construct a binary tree structure (T1) considering the alphabetical order of the following set of characters.
P, M, C, X, S, F, Z, A
- b). Give the preorder, inorder and postorder traversal of the tree T1.
- c).
 - i). Illustrate diagrammatically the insertion of a node N into T1. The resultant tree is T2.
 - ii). Explain the concept that you used when inserting the node N.
- d). Which is more difficult in a tree structure, insertion or deletion? Justify your answer.
- e). Are T1 and T2 strictly binary trees? Justify your answer.

Q4.

- a). Give the array based type definition of a stack data structure. Assume the stack may consist of a maximum of 50 elements.
- b). Write pascal procedures/ functions for the following stack operations.
 - i). PUSH (x, s) : Inserts an element into the stack
 - ii). POP (s) : Deletes an element from the stack.
- c). It is possible to keep two stacks in a single array, if one grows from position 1 of the array, the other grows from the last position. Write a procedure PUSH (x, S) that pushes element x onto stack S, where S is one of the stacks on the array. Include all necessary error checks in your procedure.

Q5.

- a). Describe the Queue data structure, using appropriate diagrams.
- b). Write suitable procedures/functions to perform following tasks.
 - i). ENQUEUE (x, Q) : Inserts an element into the queue.
 - ii). DISPLAY (Q) : Displays the contents in the queue.
- c). Using a queue data structure and a stack data structure, write a program to check whether a given word is "Palindromic". (A palindromic word reads the same in both backwards and forwards. eg. "MADAM" is palindromic.)

Q6.

- a). State the array based type definition of a binary tree structure with a maximum of 100 nodes.
- b). Write suitable procedures/ functions to implement the following operations, using the structure you defined in part (a).
 - i). SETLEFT (P, X) : Inserts a left child to a tree.
 - ii). INFO (P) : Finds the information of the Pth node, there has to be a non zero node p.
 - iii). FATHERNODE (P) : Returns the pointer to the father of P.
- c). "Searching is more easier in the tree structure than in the list structure" . Do you agree with this statement ? Justify your answer.

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