WINTER-2017

UNIT-1

Q.1 a) What are the various operations associated with word processing? How they are implemented using basic string operations. **(8)**

b) Write procedure which finds the location LOCI of the largest element and the location LOC2 of the second largest element in an array. Also find the values of the largest and second largest elements. **(6)**

Q.2 a) Consider the pattern p = abc. Use slow pattern matching algorithm to find the number of comparisons to find the INDEX of P in each of the following texts T. **(8)**

    i) a^{20},   **ii)** $(abc)^{10}$,   **iii)** $(cbab)^{10}$,   **iv)** D^{10}

b) Prove that complexity of first pattern matching algorithm is $O(n^2)$. **(6)**

UNIT-2

Q.3 a) Give and explain the algorithm for Binary search. **(5)**

b) Suppose a company keeps a linear array YEAR (1920-1970) such that the YEAR [K] contains the number of employees born in year k. Write a module for each of the following tasks. **(8)**

    i. To print each of the years in which no employees was born.

    ii. To find the number NNN of years in which no employees was born.

    iii. To find the number N_{50} of employees who will be at least 50 years old at the end of the year (Assume 1984 is the current year).

    iv. To find the number N1. of employees who will be at least L years old at the end of the year (Assume 1984 is current year).

Q.4 a) Suppose multidimensional array. A and B are declared using.

A(-2:2, 2:22) and B(1:8, -5:5, -10:5).

   i. Find the length of each dimension and number of element in A and B.

   ii. Consider the element B[3, 3, 3] in B. Find the effective indices $\in_1$, $\in_2$ and $\in_3$ and the address of the element assuming Base [B] = 400 and there are w = 4 words per memory location. **(7)**

b) A college uses the following structure for a graduating class:

1 Student (200)

  2 Name

       3 Last

       3 First

       3 Middle initial

2 major

2 SAT

       3 Verbal

       3 Math

2 GPA(4)

2 CUM

Here, GPA(k) refers to the grade point a average during the kth year and CUM refers to the cumulative grade point average.

   i. How many elementary items are there in the file?

   ii. How does one access (i) the major of the eighth student and (ii) the sophomore GPA of the forty-fifth student?

   iii. Find each output:

a) Write : Name[15]   **b)** Write: CUM

c) Write GPA[2]   **d)** Write: GPA [1,3]   **(6)**

UNIT-3

Q.5 a) Discuss the advantages, if any of a two-way list over one-way list for each of the following operations.   **(7)**

  i. Traversing the list to process each mode.

  ii. Deleting a node whose LOC is given

  iii. Searching am unsorted list for a given element.

  iv. Searching a sorted list for a given element ITEM.

  v. Inserting a node before the mode with given location LOC.

  vi. Inserting a node after the node with a given location LOC.

b) Consider the following polynomial

$P(x, y, z) = 2xy^2z^3 + 3x^2yz^2 + 4xy^3z + 5x^2y^2 + 6y^3z + 7x^3z + 8xy^2z^5 + 9.$ **(6)**

  i. Remove the polynomial so that the terms are ordered lexicographically.

  ii. Suppose the terms are sorted in parallel arrays COEF, XEXP, YEXP and ZEXP with the header node first. Assign values to an array LINK so that the linked list contains the ordered sequence of terms.   **(7)**

Q.6 a) Suppose LIST is a header (circular) list in memory. Write Algorithm which deletes last node from LIST.   **(7)**

b) Give and explain the algorithm to insert a node ITEM so that ITEM follows the node with location LOC or inserts ITEM as the first node when LOC = NULL.   **(6)**

UNIT-4

Q.7 a) Write and explain the algorithm for transforming the infix expression into Postfix expression. **(7)**

b) Suppose S contains the following n = 5 letters (A) B C D (E) Find the number of comparisons to sort S using quicksort. What general conclusion can one make, if any? **(7)**

Q.8 a) Let a and b denote positive integers, suppose a function Q is defined recursively as follows:

$$Q(a,b) = \begin{cases} 0 & \text{if } a < b \\ Q(a-b, b+1) & \text{if } b \le a \end{cases}$$

Find the value of Q (2, 3) and Q (14, 3). **(7)**

b) What is STACK? Give the procedures to PUSH and POP an ITEM into a Linked Stack. **(7)**

UNIT-5

Q.9 a) Suppose a binary tree T is in memory. Write a recursive procedure which finds the number NUM of nodes in T. **(6)**

b) A binary tree T has 9 nodes. The inorder and preorder traversals of T yields the following sequences of nodes.

Inorder: E A C K F H D B G

Preorder: F A E K C D H G B

Draw the tree. **(7)**

Q.10 a) Write and explain an algorithm for post order traversal of trees. **(6)**

b) Suppose A, B, C, D, E, F, G and H are 8 data items, and suppose they are assigned weights as follows.

Data Item: A B C D E F G H

Weight: 22 5 11 19 2 11 25 5

Construct the tree T with minimum weighted path length using the above data and Huffman's algorithm. **(7)**

UNIT-6

Q.11 a) Explain the Warshall's algorithm for finding the shortest path with suitable example. **(7)**

b) Suppose an array contains 8 elements as follows

77, 33, 44, 11, 88, 22, 66, 55.

Apply selection sort to arrange this in ascending order show all passes. **(6)**

Q.12 a) Explain the algorithm for Depth first search. **(7)**

b) Suppose 9 cards are punched as follows.

348, 143, 361, 423, 538, 128, 321, 543, 366

Apply radix sort to sort numbers in three phases. **(6)**