B.E. Fourth Semester (Information Technology) (CGS)
10719 : Data Structures : 4 IT 01

P. Pages : 3

Time : Three Hours

AU - 2604

Max. Marks : 80

0731

Notes :
1. Due credit will be given to neatness and adequate dimensions.
2. Assume suitable data wherever necessary.
3. Illustrate your answer necessary with the help of neat sketches.
4. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) Write a procedure which finds the location LOC1 of the largest element and location LOC2 of the second largest element in an array with $n>1$ elements.   7

   b) Describe briefly the three types of structures used for storing strings.   7

OR

2. a) For each of the following patterns P and text T find the number of comparisons to find the INDEX of P in T using 'slow' algorithm.   7

   a) $P = abc$, $T = (ab)^5$

   b) $P = abc$, $T = (ab)^{2n}$

   c) $P = aaa$, $T = (aabb)^3$

   d) $P = aaab$, $T = a^{20}$

   b) Write a algorithm which replaces every occurrence of pattern P in the text T by another pattern Q.   7

3. a) Using bubble sort algorithm to find the number of comparison and number of interchanges which alphabetized the Letter 'HAWKING' (i.e. sorted to AGHIKNW). Show all intermediate steps.   7

   b) Consider multidimensional arrays: 6
   $X(-5:5, 3:33)$ $Y(3:10, 1:15, 10:20)$
   a) Find length of each dimension and the number of elements in X and Y.
   b) Suppose Base $(Y) = 400$ and there are $W=4$ words per memory location. Find the effective indices E_1, E_2, E_3 and the address of $Y[5, 10, 15]$ assuming Y is stored in row major order.

OR

4. a) Write binary search algorithm which finds the location LOC of ITEM in the array DATA or sets LOC=NULL.   7

   b) An array A contains 35 positive integers. Write a module which   6
   a) Finds all pairs of elements whose sum is 35
   b) Find the number EVENUM of elements of A, which are even and number ODDNUM of elements of A which are odd.

---

5. a) Write a procedure which finds location LOC of the last node in a sorted list such that INFO [LOC] < ITEM or sets LOC = NULL.   7

   b) What is header linked list? Explain with example different types of header linked list.   6

OR

6. a) Explain with diagram insertion of node N in a two way linked list in between two nodes A and B.   7

   b) The following list of names is assigned in order to a linear array INFO. Mary, June, Baby, Paula, Diana, Audrey, Karen, Nancy, Ruth, Eileen, Sandra, Helen. That is, INFO [1] = Mary INFO [2] = June .... INFO [12] = Helen. Assign values to an array LINK and a variable START so that INFO, LINK, START form an alphabetical list of names.   6

7. a) Using stack, translate the infix expression into its equivalent postfix expression show all steps.   7
   $(A - B)/((D + E) * F)$

   b) Let N be an integer and suppose H (N) is recursively defined by.   7
   $$H(N) = \begin{cases} 3*N, & \text{if } N < 5 \\ 2*H(N-5)+7, & \text{otherwise} \end{cases}$$
   Find H (2). H (8), and H (24).

OR

8. a) Give recursive solution to Tower of Hanoi problem for four disks when three towers are used.   7

   b) Using quicksort algorithm, find the final position of the first character M in the given list S:"MANAGER"   7

9. a) Suppose the following sequences list the nodes of binary tree T in preorder and inorder respectively.   7
   Preorder : G, B, Q, A, C, K, F P, D, E R, H
   Inorder : Q, B, K, C, F, A, G, P, E, D, H, R
   Draw the diagram of the tree.

   b) Consider the binary search tree T as shown. Describe the tree after: 6
   a) The node M is deleted and   b) The node D is also deleted

OR

AU - 2604   2
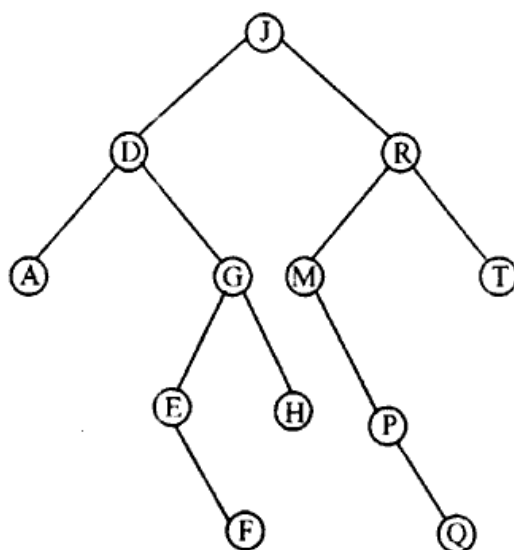
10. **a)** Suppose six weight 4, 15, 25, 5, 8, 16 are given. Find a 2-Tree T with a given weights and a minimum weighted path length P. (Use Huffman's algorithm).   **7**

    b) Build a heap H from the following list of numbers.   **6**
44, 33, 11, 55, 77, 90, 40, 60, 99, 22, 88, 66.

11. **a)** Consider a directed graph G.   **7**
    a) Find all simple paths from X to Z.
    b) Find all simple paths from Y to Z.
    c) Find indeg (Y) and outdeg (Y)
    d) Is there any sink node?
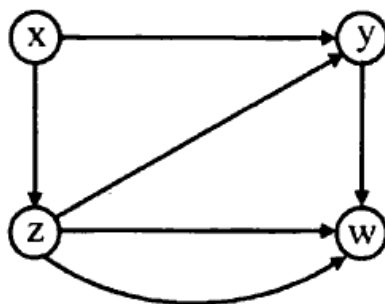
    b) Apply selection sort to the following list of elements.   **6**
46, 35, 13, 57, 79, 92, 42, 62, 99, 24, 90, 68.

OR

12. **a)** Explain Warshall algorithm for finding shorted path with suitable example.   **7**

    b) Suppose array A contains 14 elements as follows: **6**
69, 36, 43, 25, 58, 91, 63, 14, 83, 23, 53, 47, 80, 33.
Apply merge sort algorithm to arrange this list in ascending orders show all passes and result.

****