B.E. Third Semester (Computer Science & Engineering) (CBCS) Winter 2022

Data Structures - 3 KS 04 / 3 KE 04

P. Pages : 3

Time : Three Hours

AC - 2792

Max Marks 80

Notes : 1. Assume suitable data wherever necessary.
2. Illustrate your answer necessary with the help of neat sketches.
3. Use of pen Blue/Black ink/refill only for writing the answer book.

1. a) Consider the pattern P=abc. Find number of comparisons to find INDEX of P in each of the following text using slow pattern matching algorithm. 7

a) a^{20} b) $(abc)^{10}$ c) $(cbab)^{10}$ d) d^{10}

b) Explain following string operations 7

a) SUBSTRING b) INDEX
c) // d) LENGTH

OR

2. a) Suppose T is the text 7
T="DATA STRUCTURES IS EASY"
use appropriate syntax to change T so that it reads:
a) "DATA STRUCTURES IS NOT EASY"
b) "DATA STRUCTURES IS EASY BUT COMPLEX"
c) "NOW DATA STRUCTURES IS EASY"

b) Find the table and corresponding graph for pattern P is aaabb using second pattern matching algorithm. 7

3. a) Consider the string S = 'TADOBA'. Apply bubble sort to arrange the characters in S in alphabetical order. Show all passes. Find number of comparisons and number of interchanges. 7

b) Write the algorithm to insert an element in a linear array. Assume suitable data and illustrate the method. 6

OR

4. a) Consider the following multidimensional arrays 7
$X(-5:5, 3:33)$ $Y(3:10, 1:15, 10:20)$
a) Find the length of each dimension and number of elements in X and Y.
b) Suppose Base (Y) = 400 and there are 4 words per memory location. Find the effective in dices E_1, E_2, E_3 and address of Y[5, 10, 15] assuming Y is stored in row major order.

b) Explain the concept of sparse matrix and its representation in memory. 6

5. a) Consider the polynomial expression P(X, Y, Z) in variable X, Y, Z 7

$P(X, Y, Z)\ \ 8X^2Y^2Z - 6YZ^8 + 3X^3YZ + 2XY^7Z - 5X^2Y^3 - 4XY^7Z^3$

a) Rewrite the polynomial so that the terms are ordered.

b) Suppose the terms are stored in linear array COEF, XEXP, YEXP, ZEXP with the head node first.
Assign values to link so that linked list contain the ordered sequence of terms.

b) Describe the algorithm for searching an element in a linked list. 6

OR

6. a) Write the algorithm for deleting a given node from linked list with example. 7

b) What are the advantages and disadvantages of linked list over arrays? 6

7. a) Consider the infix expression and convert it into its equivalent postfix expression 7
$((A + B)/D) \uparrow ((E - F) * G)$
use algorithmic steps.

b) Let a and be denote positive integers suppose a function Q is defined recursively as follows. 6

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

a) Find the value of Q(2, 3) and Q(14, 3)

b) What does this function do? Find Q(5861, 7).

OR

8. a) What is priority queue? Also explain method of representing a priority queue in a memory. 7

b) Suppose STACK is allocated N=6 memory cells and initially stack is empty i.e. TOP=0. 6
Find the output of the following module

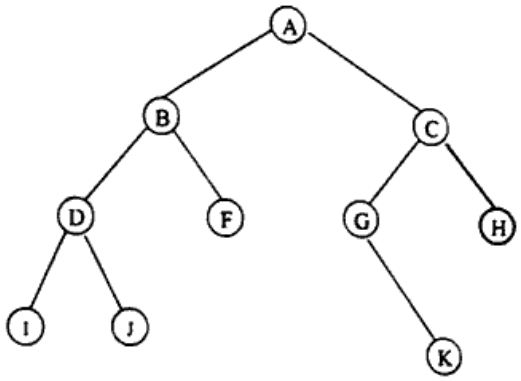
i) Set A = 2 and B = 5
ii) Call PUSH (STACK, A)
Call PUSH (STACK, 4)
Call PUSH (STACK, A + B)
Call PUSH (STACK, B + 5)
Call PUSH (STACK, 9)
iii) Repeat while TOP ≠ 0
Call POP (STACK, ITEM)
Write : ITEM
[End of Loop)
iv) Return

9. a) A binary tree T has 9 nodes. The inorder and preorder traversal of T yields the following sequence of nodes 7

Inorder	E	A	C	K	F	H	D	B	G
Preorder	F	A	E	K	C	D	H	G	B

Draw the tree

b) Traverse the given tree using Inorder, Preorder and Postorder traversal. Show step by step traversal for all nodes 7



OR

10. a) Consider following Data items and corresponding weights as follows. 7

Data Items	A	B	C	D	E	F	G	H
Weight	2	7	24	32	37	42	42	120

Construct the Huffman's tree.

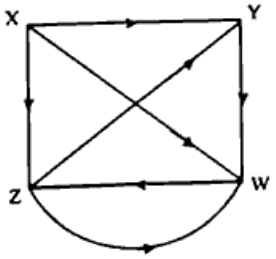
b) Suppose the following list of letters is inserted in order into an empty binary search tree 7
J, R, D, G, T, E, M, H, P, A, F, Q
a) Find the final tree T.
b) Find inorder traversal of tree T.

11. a) Assume that an array A contains the following elements. 7
77, 33, 44, 11, 88, 22, 66, 55
Apply selection sort algorithm to arrange to arrange in ascending order. Show all passes and result.

b) Explain linked representation of graph and hence describe the traversal of the graph. 6

OR

12. a) Consider the graph G whose nodes are stored in array DATA as follows 7
DATA : X, Y, W, Z
a) Find adjacency matrix A of G.
b) Find path matrix P of G
c) Is graph strongly connected?



b) Write an algorithm for Depth First Search of graph. 6

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