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Third Semester B.E. Degree Examination, Jan./Feb., 2021 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define data structures. Explain with neat block schematic different types of data structures with examples. What are the primitive operations that can be performed? (10 Marks)
- b. Define sparse matrix. Express the following matrix in triplet form and find its transpose. (10 Marks)

$$A = \begin{bmatrix} 15 & 0 & 0 & 22 \\ 0 & 11 & 3 & 0 \\ 0 & 0 & 0 & -6 \\ 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 \end{bmatrix}$$

OR

- 2 a. Explain any four dynamic memory allocation functions with syntax and example. (10 Marks)
- b. What do you mean by pattern matching? Outline the KMP algorithm. Implement the same to find out the occurrence of following pattern.
P: ABCDABD
S: ABC ABCDAB ABCDABCDABDE (10 Marks)

Module-2

- 3 a. Define Recursion. Let A and B be nonnegative integers. Suppose a function GCD is recursively defined on follows:
GCD(A, B) = GCD(B, A) if A < B
= A if B = 0
= GCD(B, MOD(A, B)) otherwise
Here MOD(A, B) read as A Modulo B. Evaluate GCD(20, 28). (04 Marks)
- b. Write C function for push(), pop() and display() routine of STACK. (08 Marks)
- c. Outline the algorithm for infix to postfix. Using the same algorithm convert following INFIX expression to equivalent POSTFIX.
((H * (((A + ((B + C) * D)) * F) * G) * E)) + J (08 Marks)

OR

- 4 a. Write a C function CQInsert() and CQDelete() operations on circular queue. (08 Marks)
- b. Outline the algorithm for infix to prefix. Using the same algorithm convert following INFIX to equivalent PREFIX.
((H * (((A + ((B + C) * D)) * F) * G) * E)) + J (08 Marks)
- c. Evaluate the following postfix expression by showing the contents of the stack.
5 4 6 + * 4 9 3 / + * (04 Marks)

Module-3

- 5 a. Write C functions for the following operations on linked list:
- Insertion at the beginning
 - Insertion at the end
 - Deletion at the beginning
 - Deletion at the end.
- (12 Marks)
- b. Explain concept of sparse matrix representation using linked list. Represent the following sparse matrix in linked list format.
- (08 Marks)
- $$A = \begin{bmatrix} 0 & 0 & 3 & 0 & 4 \\ 0 & 0 & 5 & 7 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 2 & 6 & 0 & 0 \end{bmatrix}$$

OR

- 6 a. Write C function to add two polynomials. Show the linked list representation of below two polynomials and in addition.
- POLY 1: $5x^2 + 4x + 2$
 POLY 2: $3x^2 + 2x + 5$
- (08 Marks)
- b. Write C functions for following operations on circular linked list:
- Insertion at the beginning
 - Insertion at the end
 - Deletion at the beginning
 - Deletion at the end.
- (12 Marks)

Module-4

- 7 a. Define Binary tree with an example. Write C recursive routine to traverse the given tree using inorder, preorder and postorder.
- (08 Marks)
- b. Define binary search tree. Draw the BST for the following input:
 14 15 4 9 7 18 3 5 16 20 17 9
 Give recursive search function to search an element in that tree.
- (06 Marks)
- c. Given the following traversal, draw a binary tree:
- Inorder : 4 2 5 1 6 7 3 8
 Postorder : 4 5 2 6 7 8 3 1
 - Preorder : A B C E I F J D G H K L
 Inorder : E I C F J B G D K H L A
- (06 Marks)

OR

- 8 a. Represent the below given tree in Fig.Q.8(a), using
- Linked list representation
 - Left child right sibling representation.
- (08 Marks)

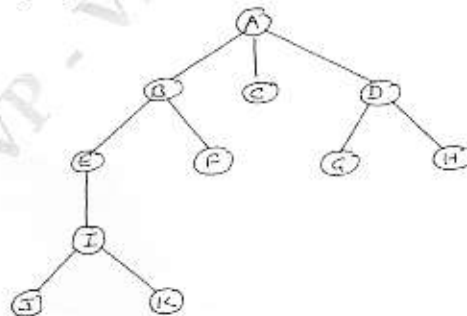


Fig.Q.8(a)



- b. Define threaded binary tree. List its advantages and disadvantages. Draw the one way threading and two way threading of the following binary tree. (Refer Fig.Q.8(b)). (08 Marks)

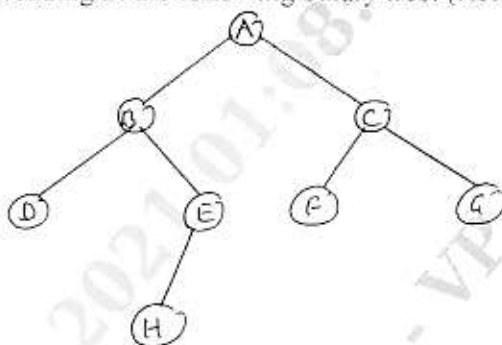


Fig.Q.8(b)

- c. Write function to insert an element in a binary search tree. (04 Marks)

Module-5

- 9 a. Define the following terminologies with examples:
i) Digraph ii) Weighted graph iii) Self loop iv) Parallel edges (08 Marks)
- b. Give the adjacency matrix, incidence matrix and linked list representation of the following undirected graph. (06 Marks)

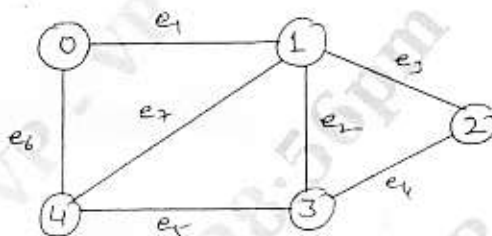


Fig.Q.9(b)

- c. Arrange the following elements in ascending order using RADIX SORT
151, 60, 875, 342, 12, 477, 689, 128, 15 (06 Marks)

OR

- 10 a. Explain different types of HASH function with example. (10 Marks)
- b. Explain any five file operations along with syntax and example. (10 Marks)
