

# CBCS SCHEME

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18CS32

## 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: (06 Marks)
- 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

OR

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

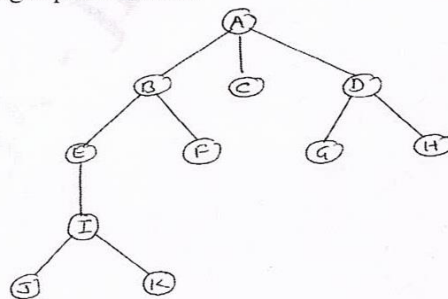


Fig.Q.8(a)

- 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)

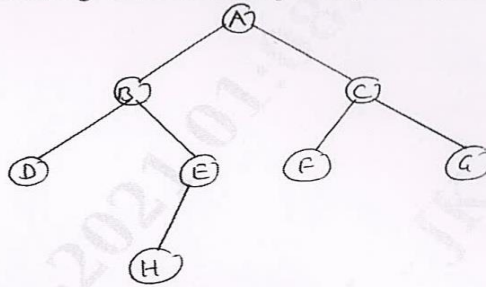


Fig.Q.8(b)

- 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)

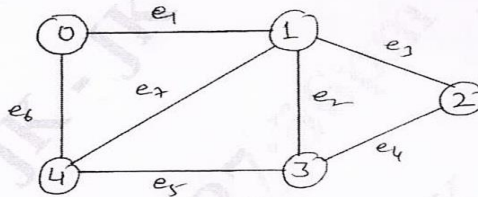


Fig.Q.9(b)

- 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)

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