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**15CS33**

## Third Semester B.E. Degree Examination, Aug./Sept. 2020 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Differentiate between structures and unions. (04 Marks)  
 b. Write function to:  
     (i) Insert an element into an array. (06 Marks)  
     (ii) Delete an element from an array. (06 Marks)  
 c. Explain dynamic memory allocation in detail. (06 Marks)

**OR**

- 2 a. Define data structure. Give its classification. (06 Marks)  
 b. Consider the following polynomial:  
 $A(x) = 4x^{15} + 3x^4 + 5$  and  $B(x) = x^4 + 10x^2 + 1$   
 Show diagrammatically how these two polynomials can be stored in a 1-D array. Also give its C representation. (04 Marks)  
 c. Give the ADT of sparse matrix and show with suitable example. Sparse matrix representation storing as triplet. (06 Marks)

### Module-2

- 3 a. Define stack. Implement push and pop functions for stack using arrays. (08 Marks)  
 b. Write the postfix form of the following expression using stack:  
     (i)  $((6 + (3 - 2) \times 4) \div 5 + 7)$   
     (ii)  $(a + b) * d + e / (f + a * d) + c$  (08 Marks)

**OR**

- 4 a. List the disadvantages of linear queue and how is it solved in circular queue. Give the algorithm to insert and delete an element in a circular queue. (08 Marks)  
 b. Write a function to evaluate postfix expression and convert the following expression to postfix expression and trace for the given data  $a = 6, b = 3, c = 1, d = 2, e = 4$ .  
 $((a / (b - c + d)) * (e - a) * c)$ . (08 Marks)

### Module-3

- 5 a. Write the following function for singly linked list,  
     (i) insert front      (ii) delete end (08 Marks)  
 b. List out the difference between the doubly linked list and singly linked list. Explain with example the following operations on doubly linked list.  
     (i) Insert a node at the beginning. (08 Marks)  
     (ii) Deleting a node with given value. (08 Marks)

**OR**

- 6 a. Define linked list. Explain in detail the primitive operation performed on singly linked list. (08 Marks)  
 b. Write C program to implement linked stack. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
 2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

**Module-4**

- 7 a. What is tree? With suitable example define  
 (i) Binary tree (ii) Level of tree (iii) Complete binary tree. (08 Marks)  
 b. Draw the binary tree for the following expression  $3+4*(7-6)/4+3$ . Traverse the generated tree using inorder, postorder and preorder. (08 Marks)

**OR**

- 8 a. Given inorder : DJGBHEAFKIC and  
 Postorder : JGDHEBKITCA construct binary tree and give its preorder traversal. (08 Marks)  
 b. Write a function to insert an item into an ordered binary search tree (Duplicate item not allowed). (08 Marks)

**Module-5**

- 9 a. Define graph. Give adjacency matrix and adjacency linked list for the given weighted graph in Fig. Q9 (a). (08 Marks)

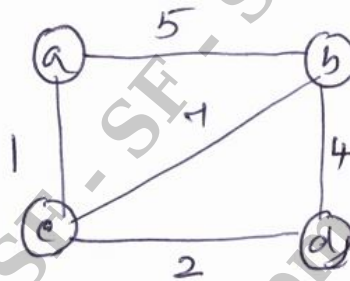


Fig. Q9 (a)

- b. What are the methods used for traversing the graph. Explain one with example. (08 Marks)

**OR**

- 10 a. How insertion sort works? Trace the insertion sort algorithm for the following data in ascending order:  
 77, 33, 44, 11, 88, 22, 66, 55 (08 Marks)  
 b. What is collision? What are the methods used to resolve collision? Explain linear probing with an example. (08 Marks)

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