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# CBCS Scheme



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2 K L I 6 C S O O Y

15CS33

## Third Semester B.E. Degree Examination, June/July 2018 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. Explain with example : i) insertion and ii) deletion in an array. (08 Marks)  
c. Suppose each student in a class of 25 students is given 4 tests, assume the students are numbered from 1 to 25, and the test scores are assigned in the  $25 \times 4$  matrix called SCORE. Suppose Base (SCORE) = 200,  $w = 4$  and the programming language uses row-major order to store this 2D array, then find the address of 3<sup>rd</sup> test of 12<sup>th</sup> student i.e SCORE (12, 3). (04 Marks)

OR

- 2 a. List and explain any 4 functions supported in C for dynamic memory allocation with examples. (08 Marks)  
b. Consider 2 polynomials  $A(x) = 2x^{1000} + 1$  and  $B(x) = x^4 + 10x^3 + 3x^2 + 1$  with a diagram show how these polynomials are stored in 1D array. (02 Marks)  
c. With an example illustrate that "product of 2 sparse matrices may not be sparse". Also write a C function for matrix multiplication of 2 sparse matrices. (06 Marks)

### Module-2

- 3 a. Write an algorithm to evaluate a postfix expression. Evaluate the following postfix expression  $abc + * d e / -$  where  $a = 5, b = 6, c = 2, d = 12, e = 4$ . (06 Marks)  
b. Write the algorithm for Ackermann function. Evaluate  $A(1, 2)$  using ACKERMANN function. (04 Marks)  
c. With a neat diagram explain ONE-WAY list representation of a priority queue. (06 Marks)

OR

- 4 a. Write a C program demonstrating the various stack operations, including cases for overflow and underflow of STACKS. (08 Marks)  
b. Describe how you could model a maze, where 0 represents open paths and 1 represents barriers. What moves are permitted in the matrix model? Provide an example MAZE together with its allowable moves and table of moves. (08 Marks)

### Module-3

- 5 a. Write a function for singly linked lists with integer data, to search an element in the list that is unsorted and a list that is sorted. (08 Marks)  
b. Given 2 singly linked lists. LIST-1 and LIST-2. Write an algorithm to form a new list LIST-3 using concatenation of the lists LIST-1 and LIST-2. (08 Marks)

1 of 2

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.

OR

- 6 a. Write a note on header linked list. Explain the widely used header lists with diagrams. (05 Marks)
- b. List out any 2 differences between doubly linked lists and singly linked list. (02 Marks)
- c. Illustrate with examples how to insert a node at the beginning, INSERT a node at intermediate position, DELETE a node with a given value. (09 Marks)

**Module-4**

- 7 a. Write a short note on threaded binary trees and state the rules to construct a threaded binary tree. (08 Marks)
- b. With separate functions illustrate recursive search and iterative search of a binary search tree. (08 Marks)

OR

- 8 a. Consider the following tree T in (Fig.8(a)) write the preorder, inorder, postorder for the tree T. Also find the depth of TREE in (Fig.Q8(a)). (04 Marks)

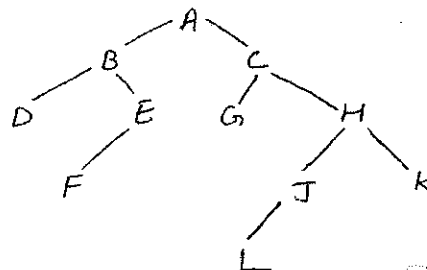


Fig.Q8(a)

- b. Write functions to illustrate “copying of binary trees”, and “testing equality of binary trees”. (08 Marks)
- c. Define complete binary tree. Illustrate with examples. (04 Marks)

**Module-5**

- 9 a. State and explain WARSHALLS algorithm with an example. (08 Marks)
- b. Write an algorithm for insertion sort. Apply insertion sort, showing the various passes to sort the array A, where A = [77, 33, 44, 11, 88, 22, 66, 55]. (08 Marks)

OR

- 10 a. Write a short note on hashing. Explain any 3 popular HASH functions. (08 Marks)
- b. What do you understand by the term file organization? Briefly summarize any 3 widely used file organization techniques. (08 Marks)

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**Third Semester B.E. Degree Examination, Dec.2017/Jan.2018**

## 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. Define data structures. Give its classification. (06 Marks)
- b. Define structures with example. (04 Marks)
- c. Define pointers. Give advantages and disadvantages of pointers. (06 Marks)

OR

- 2 a. Write a program to (i) reverse a string, (ii) concatenate two strings. (08 Marks)
- b. Explain dynamic memory allocation in detail. (08 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:  
(i)  $((6 + (3 - 2) * 4) \uparrow 5 + 7)$  (ii)  $A \$ B \$ C * D$  (08 Marks)

OR

- 4 a. Define queues. Implement Qinsert and Qdelete function for queues using arrays. (08 Marks)
- b. Define recursion. Write recursive program for (i) factorial of a number, (ii) tower of Hanoi. (08 Marks)

### Module-3

- 5 a. Write the following functions for singly linked list: (i) Reverse the list (ii) Concatenate two lists. (08 Marks)
- b. Write functions insert\_front and delete\_front using doubly linked list. (08 Marks)

OR

- 6 a. Write an algorithm to add two polynomials. (08 Marks)
- b. Define sparse matrix. Give sparse matrix representation of linked list for given matrix. (08 Marks)

$$A = \begin{bmatrix} 0 & 0 & 4 & 0 & 0 \\ 6 & 5 & 0 & 0 & 0 \\ 0 & 3 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{bmatrix}$$

(08 Marks)

### Module-4

- 7 a. What is a tree? Explain :  
i) Binary tree  
ii) Strictly binary tree  
iii) Complete binary tree  
iv) Skewed binary tree (08 Marks)
- b. Given inorder sequence: DJGBHEAFKIC and postorder sequence: JGDHEBKIFCA. Construct binary tree and give preorder traversal. (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.

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OR

- 8 a. Explain threaded binary tree in detail. (08 Marks)  
 b. Write a function to insert an item into an ordered binary search tree (duplicate items are 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).

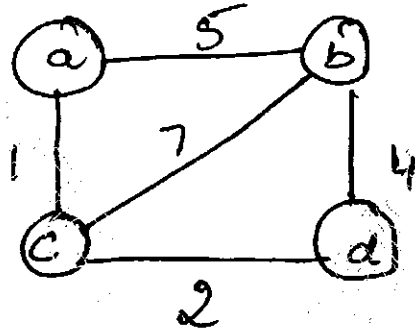


Fig.Q9(a)

- b. Write an algorithm for breadth first search and depth first search.

(08 Marks)

(08 Marks)

OR

- 10 a. Write an algorithm for Radix sort.  
 b. Explain Hashing in detail.

(08 Marks)

(08 Marks)



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Third Semester B.E. Degree Examination, June/July 2017

## Data Structure and Applications

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

- 1 a. Write a C program with an appropriate structure definition and variable declaration to read and display information about 5 employees using nested structures. Consider the following fields like Ename, Empid, DOJ (Date, Month, Year) and Salary (Basic, DA, HRA). (08 Marks)
- b. Give ADT of sparse matrix and show with a suitable example sparse matrix representation storing as triples. Give a sample transpose function to transpose sparse matrix. (08 Marks)

OR

- 2 a. What is a polynomial? What is the degree of the polynomial? Write a function to add two polynomials. (08 Marks)
- b. List and explain the functions supported by C for dynamic memory allocation. (04 Marks)
- c. Write a C program to concatenate Fname and Lname of a person without using any library function. (04 Marks)

### Module-2

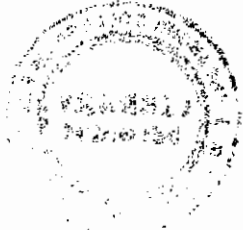
- 3 a. Define stack and write the ADT of stack. Implement push and pop functions for stack using arrays with StackFull and StackEmpty conditions. (08 Marks)
- b. What is an input restricted double ended queue? Implement the same with the supporting functions. (08 Marks)

OR

- 4 a. Write the postfix form of the following expression using stack:  
 i)  $(a + b) * d + e / (f + a * d) + c$  ii)  $((a / (b - c + d)) * (e - a) * c)$  (04 Marks)
- b. Write a function to evaluate a postfix expression and trace the same for the expression  $a/b/c - d * e + a * c$  where  $a = 6, b = 3, c = 1, d = 2, e = 4$ . (06 Marks)
- c. Explain with a suitable example, how would you implement circular queue using dynamically allocated arrays. (06 Marks)

### Module-3

- 5 a. Give the node structure to create a linked list of integers and write C functions to perform the following:  
 i) Create a three node list with data 10, 20 and 30.  
 ii) Insert a node with the data value 15 in between the nodes having the data values 10 and 20.  
 iii) Delete the node whose data is 20.  
 iv) Display the resulting singly linked list. (10 Marks)
- b. Write a node structure for linked representation of polynomial. Explain the algorithm to add two polynomials represented using linked list. (06 Marks)



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OR

- 6 a. Write C functions to perform the following:
- Reversing a singly linked list.
  - Concatenating singly linked list.
  - Finding the length of the list.
- (06 Marks)
- b. List out the difference between the doubly linked list and singly linked list. Illustrate with example the following operations on a doubly linked list:
- Inserting a node at the beginning.
  - Inserting at the intermediate position.
  - Deletion of a node with a given value.
  - Search a key element.
- (10 Marks)

#### Module-4

- 7 a. Define binary trees. Explain the following with example:
- Complete binary tree
  - Skewed binary tree
  - Almost complete binary tree
  - Degree of a binary tree.
- (09 Marks)
- b. For the given data, draw a binary search tree and show the array and linked representation of the same 100, 85, 45, 55, 110, 20, 70, 65.
- (07 Marks)

OR

- 8 a. Draw a binary tree for the following expression  $3 + 4 * (7 - 6) / 4 + 3$ . Traverse the above generated tree using inorder, preorder and postorder. Also write a function in C for each one.
- (09 Marks)
- b. What is the advantage of threaded binary tree over binary tree? Explain the construction of threaded binary tree for 10, 20, 30, 40, 50.
- (07 Marks)

#### Module-5

- 9 a. Define graph. Write the difference between graph and trees. For the given graph, show the adjacency matrix and adjacency list representation of the graph. [Refer Fig.Q9(a)]

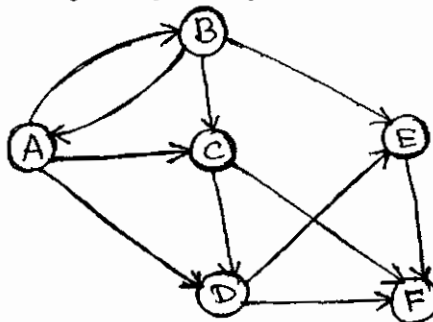


Fig.Q9(a)

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

OR

- 10 a. Write a C function for insertion sort. Sort the following list using insertion sort: 50, 30, 10, 70, 40, 20, 60.
- (08 Marks)
- b. What is collision? What are the methods to resolve collision? Explain linear probing with an example.
- (08 Marks)

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**Third Semester B.E. Degree Examination, Dec.2016/Jan.2017**

## Data Structures and Applications

Time: 3 hrs.

Max. Marks: 80

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

### Module-1

1. a. What is an algorithm? Explain the criteria that an algorithm must satisfy. (08 Marks)  
 b. Write a function to sort integers using selection sort algorithm. (04 Marks)  
 c. Consider two polynomials,  
 $A(x) = 4x^{15} + 3x^4 + 5$  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)

**OR**

2. a. Write the Knuth Morris Pratt pattern matching algorithm and apply the same to search the pattern 'abcdabcy' in the text 'abcxabcdbxabcdbcdabcy'. (08 Marks)  
 b. Write the fast transpose algorithm to transpose the given sparse matrix. Express the given sparse matrix as triplets and find its transpose.

$$A = \begin{bmatrix} 10 & 0 & 0 & 25 & 0 \\ 0 & 23 & 0 & 0 & 45 \\ 0 & 0 & 0 & 0 & 32 \\ 42 & 0 & 0 & 31 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 30 & 0 & 0 \end{bmatrix}$$

(08 Marks)

### Module-2

3. a. Write the algorithm to implement a stack using dynamic array whose initial capacity is 1 and array doubling is used to increase the stack's capacity (that is dynamically reallocate twice the memory) whenever an element is added to a full stack. Implement the operations-push, pop and display. (08 Marks)  
 b. Write the algorithm for of tower of Hanoi. (04 Marks)  
 c. Write a note on Ackerman's function. (04 Marks)

**OR**

4. a. List the disadvantages of linear queue and explain how is it solved in circular queue. Give the algorithm to implement a circular queue with suitable example. (08 Marks)  
 b. Convert the infix expression,  $((a/(b-c+d))*(c-a)*c)$  to postfix expression. Write a function to evaluate that postfix expression and trace for the given data  $a = 6, b = 3, c = 1, d = 2, e = 4$ . (08 Marks)





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**Module-3**

- 5 a. Give the node structure to create a singly linked list of integers and write functions to perform the following :
- Create a list.
  - Assume the list contains 3 nodes with data 10, 20, 30. Insert a node with data 40 at the end of the list.
  - Insert a node with data 50 between the nodes having data values 10 and 20.
  - Display the singly linked list. (08 Marks)
- b. What is the advantage of doubly linked list over singly linked list? Illustrate with an example. (04 Marks)
- c. For the given sparse matrix, write the diagrammatic linked list representation.

$$A = \begin{bmatrix} 0 & 10 & 0 & 0 \\ 3 & 0 & 0 & 5 \\ 8 & 0 & 2 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 8 & 0 \end{bmatrix}$$

(04 Marks)

**OR**

- 6 a. Write the functions for singly linked list with integer data to search an element in the list. (08 Marks)
- b. Write the node structure for linked representation of polynomial. Explain the algorithm to add two polynomials represented using linked lists. (08 Marks)

**Module-4**

- 7 a. What is a tree? With suitable example define (i) Binary tree (ii) Level of a binary tree (iii) Complete binary tree. (08 Marks)
- b. Write the routines to traverse the given tree using (i) Pre-order traversal and (ii) Post order traversal. (08 Marks)

**OR**

- 8 a. What is a binary search tree? Write algorithm to implement for recursive search or iterative search for a binary search tree. (08 Marks)
- b. Write the routines for, (i) Create a binary tree. (ii) Testing for equality of binary trees. (08 Marks)

**Module-5**

- 9 a. What is a graph? Give the matrix and adjacency list representation of graphs. (08 Marks)
- b. Write an algorithm for bubble sort. Trace the algorithm for the data : 30, 20, 10, 40, 80, 60, 70. (08 Marks)

**OR**

- 10 a. Explain open addressing and chaining used to handle overflows in hashing. (05 Marks)
- b. Explain directoryless dynamic hashing. (05 Marks)
- c. Briefly explain basic operations that can be performed on a file. Explain indexed sequential file organization. (06 Marks)

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