Roll No. .... Total Pages : 2

BT-3/D-18 **33002**

DATA STRUCTURES

Paper : CSE-203 E

Time : Three Hours] [Maximum Marks : 100

Note : Attempt *five* questions in all, selecting at least *one* question from each unit. All questions carry equal marks.

UNIT–I

1. (a) Discuss the various built-in and user-defined data structures along with applications in computer science and real-life. 10

(b) What is sparse matrix? How a sparse matrix is stored in computer memory? Explain using suitable examples. 10

2. What is a stack? How it is stored in computer memory? Write down algorithms for converting an infix expression into a postfix expression and evaluating a postfix expression. Explain the algorithms using suitable examples. 20

UNIT–II

3. What is deque and priority queue? How both are stored in computer memory ? Write algorithms to insert and delete an element in a priority queue using linked representation. 20

4. Write and explain the algorithms to insert and search an element form a singly, doubly and circular linked lists. 20

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UNIT–III

5. (a) Write and explain an algorithm for traversing a binary tree using inorder traversal. 10

(b) Explain the following :

(i) External and internal nodes.

(ii) Infix, prefix and postfix expression representation using trees. 10

6. What are B-trees and B+ trees? What is their significance? How can you perform insertions and deletions in B-tree and B+ trees? Explain with examples. 20

UNIT–IV

7. Write and explain the algorithm to sort the given data using merge-sort. Apply the merge-sort algorithm on the following data to show the sorting process step-by-step : 87, 88, 25, 11, 22, 56, 99, 66, 77, 33. 20

8. (a) Write and explain the DFS algorithm using suitable example. 10

(b) What do you mean by hashing? Describe various hash functions using suitable examples. 10

Roll No. .... Total Pages : 03

BT-3/D-14 **8302**

DATA STRUCTURES

CSE-203-E

Time : Three Hours] [Maximum Marks : 100

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) What is the difference between structure and union ? Discuss using suitable examples.

   (b) What do you understand by Polish Notation ? Write the procedure to convert infix expression to prefix expression.

2. Differentiate between the following :

   (a) Sequential and non-sequential implementation of stack

   (b) Linear and non-linear data structures.

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Unit II

3. (a) What is a circular queue ? What are its advantages over simple queue ? Write the procedure to insert an element into a circular queue ?

   (b) What is a priority queue ? Discuss its any application.

4. (a) What is a Doubly Linked List ? Write the procedure to insert a node in a sorted doubly linked list.

   (b) Write the PUSH and POP procedure for linked implementation of stack.

Unit III

5. What is a High Balanced Tree ? What is the need of balancing a tree ? Discuss the procedure to insert a node in a AVL Tree.

6. (a) Differentiate between B tree and B+ tree.

   (b) A binary tree T has 12 nodes. The inorder and preorder traversals of T yield the following sequence of nodes :

   Preorder : G B Q A C K F P D E R H

   Inorder : Q B K C F A G P E D H R

   Construct the tree.

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Unit IV

7. (a) Write a recursive procedure to perform binary search.

   (b) Define Graph. What is the difference between a graph and a tree ? Discuss the depth-first approach to graph traversal.

8. (a) Explain the radix sort using suitable example.

   (b) What is Linear Search ? Write the procedure and discuss its time complexity for average, best and worst cases.

Roll No. .... Total Pages : 3

BT-3/D-12 **8302**

DATA STRUCTURES

Paper—CSE-203E

Option–II

Time Allowed : 3 Hours] [Maximum Marks : 100

Note : Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks. Always write suitable explanation of logic or comment in the program code, wherever needed. In all questions, wherever algorithm or pseudo-code is to be written, you can write equivalent function in C-language syntax also. It will not lead to any deduction of marks. Rather it will be preferable.

UNIT–I

1. (a) Write a modular program in C which finds and stores transpose of an m * n matrix into same matrix. No other matrix should be used in the program at all. Max 7 marks will be given if transpose is not stored in same matrix.
   (b) What do you understand by ADT ? Explain. 14,6
2. (a) Write algorithm to convert given infix expression to postfix expression.
   (b) Write a program to convert a given Sparse matrix to the equivalent non-sparse matrix. 10,10

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UNIT–II

3. (a) Write algorithm to reverse a singly linked list and explain its working.
   (b) What is a priority queue and what are its applications? 12,8
4. (a) Write a algorithm to delete a node from a given doubly linked list. The position of the node will be supplied as an argument to the module. The position can be 1 (meaning first node) to n. Declarethe necessary structures needed for this module.
   (b) Write linked list implementation of queue operations. 10,10

UNIT–III

5. (a) Using examples, show the prefix and postfix expressions representation using trees.
   (b) How lists are represented using trees ? Explain.
   (c) Write algorithm to find height of a binary tree. Explain its working. http://www.kuonline.in 6,6,8
6. (a) Write short notes on the following :
      (i) Balanced multi-way search trees
      (ii) B-trees.
   (b) Write a non-recursive implementation of pre-order traversal of binary tree. 10,10

UNIT–IV

7. (a) Describe the working of linear probing and chaining. Where are these useful ?

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(b) Step by step, show, how following numbers get sorted using heap sort :

20, 18, 35, 16, 10, 18, 2, 14. 10,10

8. (a) Define minimum spanning tree. How can we find a minimum spanning tree from a given graph ? Explain with help of a suitable example.

(b) Draw a directed graph of at least 5 nodes and having at least 8 edges. Show its representation using adjacency list.

(c) Write algorithm for bubble sort. 8,5,7

Roll No. ....

8302

Printed Pages : 3

BT–3 / D–13

DATA STRUCTURES

Paper–CSE–203E, Option–I

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *(i) Attempt total **five** questions attempting at least one question from each of 4 units.*

(ii) Always write suitable explanation of logic or comments in the program code, wherever needed.

(iii) In all questions, wherever algorithm or pseudo-code is to be written, you can write equivalent function in C-language syntax also. It will not lead to any deduction of marks. Rather it will be preferable.

Unit–I

1. (a) A student's record contains name, roll-no and fee. Write a modular program which reads record of n students and displays the details of the student who has paid highest fee. Assume that fee paid by every student is unique. Also find the roll numbers of students whose name start with 'A'.

(b) Derive formula for addressing an element at a particular index in one-dimension array and explain it. 15+5=20

[Turn over

2. (a) Using array, implement stack and its operations.

(b) Write algorithm to evaluate a given postfix expression. 10+10=20

Unit–II

3. (a) Compare continuous and linked implementation of list.

(b) Write a function in C to split a given list of integers represented by a single connected linked list into two separate linked lists in the following way. Let the list be $L = (l_0, l_1, \ldots, l_n)$. The resultant lists would be $R_1 = (l_0, l_2, l_4, \ldots)$ and $R_t = (l_1, l_3, l_5, \ldots)$. Do not use any additional nodes. 8+12=20

4. (a) Write a C program for linked implementation of stack.

(b) Assume that a doubly linked list exists having one string in each node. Write an algorithm which finds the node having the name of highest length. The position of that node should be displayed as output. Assume that first node is at position 1, second node at position 2 and so on. 10+10=20

Unit–III

5. (a) What is use of binary search tree ?

(b) Differentiate between tree and binary tree.

(c) Write algorithm to count number of internal nodes of a binary tree. Explain its working. 4+6+10=20

6. (a) Differentiate between B Tree and B^+ Tree.

   (b) Write short note on threaded tree.

   (c) Write a function in C for preorder traversal of a binary tree. WithoutC-syntax, 5 marks will be deducted.

   5+5+10=20

Unit–IV

7. (a) List the situations when directed graph should be used and when undirected graph ?

   (b) What are different techniques for graph traversal ? Take a graph of atleast 5 nodes and 8 edges and step by step traverse it using all techniques. 6+14=20

8. (a) Write a C Program for heap sort and explain its working.

   (b) What is use of Hash function ? What are its applications ? 12+8=20

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Printed Pages : 2

33002

BT-3 / D-17

DATA STRUCTURES

Paper–CSE-203 E

Time allowed : 3 hours] *[Maximum marks : 100*

*Note :- Attempt **five** questions in all, selecting at least **one** question from each unit. All questions carry equal marks.*

Unit–I

1. What do you understand by data structure? How can you classify data structures? Also explain various major operations that can be applied on data structures. 20

2. (a) Write down the algorithm for evaluating a postfix expression. 10

   (b) What is a Sparse matrix? How can you store a sparse matrix using linear array? Explain. 10

Unit–II

3. Explain the methods to store a queue in computer memory? How a queue is different from priority queue? Explain the memory representation of queue and priority queue. Write and explain one application of queue and priority queue in brief. 20

4. (a) Differentiate between following:

   (i) Array and Linked List

   (ii) Singly Linked List and Doubly Linked List 10

   (b) Write down an algorithm to insert an element in a linked list after a given node. 10

[Turn over

Unit–III

5. What is a binary tree? Explain various traversal methods on a binary tree in brief. Write an algorithm to traverse a binary tree using any one method and explain with the help of suitable example. 10

6. What is an AVL tree? Explain the procedure to insert and delete a node in an AVL tree with the help of suitable examples in detail. 20

Unit–IV

7. (a) Explain following terms w.r.t. Graph:

   (i) Graph

   (ii) Multigraph

   (iii) Adjacency matrix

   (iv) Path matrix

   (v) Complete graph. 10

   (b) Write down the algorithm for searching a number using Binary Search. 10

8. What do you mean by Hashing? Explain various hashing function in detail. Also discuss various methods of handling collision in hashing. 20

Roll No. .... **Total Pages : 03**

BT-3/D-19 33132

DATA STRUCTURE AND ALGORITHMS

PC-CS201A

Time : Three Hours] [Maximum Marks : 75

Note : All questions in Part A and Part B are compulsory. Attempt any *four* questions from Part C selecting at least *one* question from each Unit.

Part A 15

1. Answer the following questions : 5×3=15
   (i) Differentiate between linear and non-linear data structures.
   (ii) List the operations performed in splay tree.
   (iii) Write prefix and postfix expression for (A – B/C + D)/(A + B).
   (iv) State and *two* differences between static and dynamic memory allocation.
   (v) Write the application of Warshal algorithm.

Part B 20

Unit I

2. Discuss the use of accumulator and counter in developing algorithm. 5

Unit II

3. Write algorithm to delete element in stack. 5

Unit III

4. Write algorithm for insert an element from a linked list. 5

Unit IV

5. Write algorithm for insert an element in binary tree. 5

Part C 40

Unit I

6. Differentiate linear and binary search. Write algorithm for linear search. 10

7. Differentiate Insertion and radix sort with example. 10

Unit II

8. Derive equation to determine the time complexity of quick sort. 10

9. Differentiate doubly link list and circularly link list with example. 10

Unit III

10. Discuss the dynamic implementation of queue with example. **10**

11. Discuss the traversing of in single link list with example. **10**

Unit IV

12. Differentiate static and dynamic implementation of binary tree with example. **10**

13. Compare Prim's and Kruskal's algorithm with suitable example. **10**