SARDAR RAJA COLLEGE OF ENGINEERING

RAJA NAGAR, ALANGULAM

Department of Computer Applications

Subject Name	**:**	**DATA STRUCTURES**
Subject Code	**:**	**MC9214**
Year	**:**	**I – MCA**
Semester	**:**	**I**

Prepared by

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MC9214 DATA STRUCTURES **L T P C** **3 1 0 4**

UNIT I DATA STRUCTURES **9**

Introduction – Arrays – Structures – Stack: Definition and examples, Representing Stacks - Queues and lists: Queue and its Representation, lists – Applications of Stack, Queue and Linked Lists.

UNIT II TREES **9**

Binary Trees – Operations on binary trees - Binary Tree Representations – node representation, internal and external nodes, implicit array representation – Binary tree Traversals - Huffman Algorithm – Representing Lists as Binary Trees

UNIT III SORTING AND SEARCHING **9**

General Background – Exchange sorts – Selection and Tree Sorting – Insertion Sorts – Merge and Radix Sorts – Basic Search Techniques – Tree Searching – General Search Trees – Hashing.

UNIT IV GRAPHS AND THEIR APPLICATIONS **9**

Graphs – An application of graphs – Representation – transitive closure - Warshall's algorithm – Shortest path algorithm - a flow Problem – Dijkstra's algorithm – An application of scheduling - Linked representation of Graphs – Graph Traversals

UNIT V STORAGE MANAGEMENT **9**

General Lists: Operations, linked list representation, using lists, Freeing list nodes - Automatic list Management: Reference count method, Garbage Collection, Algorithms, Collection and compaction

L 45 T 15 Total: 60

TEXTBOOK

1. Tanaenbaum A.S.,Langram Y. Augestein M.J " Data Structures using C"
Pearson Education , 2004

REFERNCES

1. Robert Kruse & Clovis L. Tondo " Data Structures and Program Design in C"**,**Prentice Hall , 2nd edition.,1991.

2. Weiss "Data Structures and Algorithm Analysis in C " ,Addison Wesley , SecondEdition, 1997.

MC 9214 DATA STRUCTURES

Description:

- Introduction of Data to be designed for Programming Language
- It Studies about the basic Data Structures such as Stack and Queue and its representation.
- Detailed Knowledge of Exchange , Selection and Tree Sorting Techniques
- Detailed Knowledge of Tree Searching and Hashing Techniques.
- To know about Graph Data Structures representation and its applications
- To know about Data Structures to be managed in Storage Medium and Utilization.

Objectives:

- To be on familiar terms with about the Data to be designed for Programming Language
- To identify about the Application of Stack and Queue Data Structures.
- To distinguish about the Sorting and Searching Techniques
- To be acquainted with about Graph Data Structures representation and its applications
- To recognize about Data Structures to be Managed in Storage Medium

Micro Lesson Plan

Hours	Lecture topics	Reading
	Unit I - Data Structures	T 1
1	Introduction	
2	Arrays	
3	Structures	
4	Stack: Definition and examples, Representing Stacks	
5	Queues and lists: Queue and its Representation,	
6	lists – Applications of Stack,	
7	Queue	
8		
9	Linked Lists	
10	Tutorial 1: Expression Evaluation	Web Reference
11	Tutorial 2: Tower of Hanoi problem	
12	Tutorial 1: Efficiency comparison with Data Structures	
	Unit II - Trees	T 1
13	Binary Trees	
14	Operations on binary trees	
15	Binary Tree Representations	
16	Node representation,	
17	internal and external nodes	
18	implicit array representation	
19	Binary tree Traversals	
20	Huffman Algorithm	
21	Representing Lists as Binary Trees	
22	Tutorial 1: Threaded Binary Tree	Web Reference
23	Tutorial 2: AVL Binary Tree	
24	Tutorial 3: Binary Tree Traversals	
	Unit III – Sorting and Searching	T 1
25	General Background	
26	Exchange sorts	
27	Selection and Tree Sorting	
28	Insertion Sorts	
29	Merge and Radix Sorts	
30	Basic Search Techniques	
31	Tree Searching	
32	General Search Trees	
33	Hashing	
34	Tutorial 1: Comparison of Sorting Techniques	Web Reference
35	Tutorial 2: Comparison of Search Techniques	
36	Tutorial 3: hashing example: Inserting Numbers in Storage as Index	
	Unit IV – Graph and their applications	T 1
37	Graphs	
38	An application of graphs	
39	Representation, transitive closure	

40	Warshall's algorithm	
41	Shortest path algorithm - a flow Problem	
42	Dijkstra's algorithm	
43	An application of scheduling	
44	Linked representation of Graphs	
45	Graph Traversals	
46	Tutorial 1: Depth First Search with diagrams	Web Reference
47	Tutorial 2: Breadth First Search with diagrams	
48	Tutorial 3: Application Scheduler – IBM Web Sphere	
	Unit V Storage Management	T 1
49	General Lists	
50	Operations,	
51	linked list representation,	
52	using lists	
53	Freeing list nodes	
54	Automatic list Management:	
55	Reference count method,	
56	Garbage Collection,	
57	Algorithms Collection and compaction	
58	Tutorial 1: Traditional Vs Modern Storage Devices	Web Reference
59	Tutorial 2: Storage usage in IBM Web Sphere	
60	Tutorial 1: Matching Application pattern to storage devices	

MCA DEGREE EXAMINATION, JANUARY 2009
First Semester
MC 1604 - DATA STRUCTURES
(Regulation 2005)

Time : 3 hours **Maximam Marks:100**

PART A (10 x 2 = 20 MARKS)

1. Write down row major array addressing function for a two Dimensional array?
2. What are the advantages of a circular queue over a conventional lineqr queue?
3. Define binary tree and Give an example?
4. Explain post order traversal of a binary tree?
5. Explain Exchange sort technique?
6. Write algorithm for binary search?
7. Define adjacency matrix representation of a graph?
8. Define shortest path problem. Mention any one solution to the problem?
9. Bring out the advantages of linked list representation over sequential allocation?
10. Give an algorithm for insertion of an element as first element into a singly linear Linked list?

PART B (5 x 16 = 80 MARKS)

11 (a) Define Queue as an abstract data type. Specify domain, functions and axioms of Queue?

OR

(b) Explain with an illustrative example a method of converting an infix expression into equivalent suffix expression and hence design an algorithm?

12(a) Design an algorithm to traverse through an in order threaded binary tree. Hand simulate the same on an inorder threaded binary tree of your choice?

OR

(b) Construct a binary tree with atleast 18 nodes. Give an adjacency matrixer representation to it. Design an algorithm to travers through the binary tree in preorder based on the adjacency matrix.

13 (a) Design an algorithm to sort a list of n elements using merge sort. Hand simulate on the data set (98 67 83 08 18 104 07). Give its time complexity.

OR

(b) Define hashing? Discuss various has functions and their limitations.

14 (a) Consider a graph of your choice with atleast 3 stages. Mark the source and destination vertices. Explain Dijkstra's algorithm to trace a shortest path from source to destination and hence design algorithm.

OR

(b) Given a graph characterized by an adjacency matrix, design algorithms to (i)Obtain the corresponding incidence matrix.
(ii) Check if graph is connected

15. (a) realize stack operations using doubly linked list.

OR

(b) Explain how linked list can be used to design a dynamic dictionary of English words.

MCA DEGREE EXAMINATION, May / June 2009

First Semester

MC1604 – DATA STRUCTURES

(Regulation 2005)

Time : 3 hours Maximam Marks:100

PART A (10 x 2 = 20 MARKS)

1. Write the applications of stack?
2. Differentiate the linear list and linked list
3. Define sibling, height of a tree.
4. What is tree traversal? Write the routine for inorder traversal
5. Write the time complexity for merge and radix sort
6. Why do we go for double hashing?
7. what is transitive closure? Write its worst case complexity
8. Define single source and all-pairs shortest path problem?
9. What is garbage collection? How is it performed
10. Write the need for compaction

PART B (5 x 16 = 80 MARKS)

11. a) The problem: It has n people, numbered from 1 to n, are sitting in a circle. Starting at person 1, a hot potato is passed. After m passes the person holding the potato is eliminated, the circle closes ranks, and the game continues with the person who was sitting after the eliminated person picking up the hot potato. The last remaining person wins. Thus, if m=1 and n=5, player 3 wins and the order of elimination is 2,4,1,5. Use suitable data structure to solve this problem

OR

b) Discuss and Write the routines to implement two Stacks using only one array. Your stack routine should not declare an overflow unless every slot in the array is used

12. a) Explain Huffman coding algorithm with example and write the routines to generate Huffman trees

OR

b) Construct a Binary Search Tree using 10 distinct keys. Write the procedure to sort the keys in increasing order using proper tree traversal ii) Write short notes on threaded binary tree

13. a) Write the routines to sort n elements using merge and insertion sort. ii) Ascent the data 2, 7, 4, 5, 9, 3, 1, 6, using the above algorithms

OR

(b) Briefly explain the various hashing techniques

ii) Given input (371. 323, 173, 199, 344, 679, 989) and hash function h(x) = x mod 10, show the resulting.

ii) Given input (371. 323, 173, 199, 344, 679, 989) and hash function h(x) = x mod 10, show the resulting.

b) Closed hashing using linear probing, quadratic probing and double hashing h2(x) = 7 – (x mod 7)

14. a) Write the routines for Prim's and Kruskal's algorithm to find the minimum spanning tree of the graph G

ii) Find the minimum spanning tree for the following graph using Prim's and Kruskal's algorithm

OR

b) Discuss in detail about flow problem with proper example and write the routine for Ford-Fulkerson algorithm

15. a) Discuss in detail about Automatic list Management

OR

b) Write the routines to check whether the given string is Palindrome or not. Use the basic operations of doubly linked list to perform the same