



KINGS

COLLEGE OF ENGINEERING



DEPARTMENT OF INFORMATION TECHNOLOGY

QUESTION BANK

Subject Code: CS1201

Year/ Sem: II / III

Subject Name: Data Structures

UNIT I - PROBLEM SOLVING

PART – A (2 MARKS)

1. Define Modularity.
2. What do you mean by top down design?
3. What is meant by algorithm? What are its measures?
4. Give any four algorithmic techniques.
5. Write an algorithm to find the factorial of a given number
6. List the types of control structures
7. Define the top down design strategy
8. Define the worst case & average case complexities of an algorithm
9. What is meant by modular approach?
10. What is divide & conquer strategy?
11. What is dynamic programming?
12. What is program testing?
13. Define program verification
14. What is input/output assertion?
15. Define symbolic execution
16. Write the steps to verify a program segment with loops
17. What is CPU time?
18. Write at least five qualities & capabilities of a good algorithm
19. Write an algorithm to exchange the values of two variables
20. Write an algorithm to find N factorial (written as $n!$) where $n \geq 0$.

PART- B (16 MARKS)

1. Explain Top down design in detail.
2. (a) Explain in detail the types on analysis that can be performed on an algorithm (8)
(b) Write an algorithm to perform matrix multiplication algorithm and analyze the same (8)

CS 1201 – DATA STRUCTURES

3. Design an algorithm to evaluate the function $\sin(x)$ as defined by the infinite series expansion $\sin(x) = x/1! - x^3/3! + x^5/5! - x^7/7! + \dots$.
4. Write an algorithm to generate and print the first n terms of the Fibonacci series where $n \geq 1$ the first few terms are 0, 1, 1, 2, 3, 5, 8, 13.
5. Design an algorithm that accepts a positive integer and reverse the order of its digits.
6. Explain the Base conversion algorithm to convert a decimal integer to its corresponding octal representation

Unit II - LISTS, STACKS AND QUEUES **PART – A (2 MARKS)**

1. Define ADT.
2. Give the structure of Queue model.
3. What are the basic operations of Queue ADT?
4. What is Enqueue and Dequeue?
5. Give the applications of Queue.
6. What is the use of stack pointer?
7. What is an array?
8. Define ADT (Abstract Data Type).
9. Swap two adjacent elements by adjusting only the pointers (and not the data) using singly linked list.
10. Define a queue model.
11. What are the advantages of doubly linked list over singly linked list?
12. Define a graph
13. What is a Queue?
14. What is a circularly linked list?
15. What is linear list?
16. How will you delete a node from a linked list?
17. What is linear pattern search?
18. What is recursive data structure?
19. What is doubly linked list?

PART- B (16 MARKS)

1. Explain the implementation of stack using Linked List.
2. Explain Prefix, Infix and postfix expressions with example.
3. Explain the operations and the implementation of list ADT.
4. Give a procedure to convert an infix expression $a+b*c+(d*e+f)*g$ to postfix notation

CS 1201 – DATA STRUCTURES

5. Design and implement an algorithm to search a linear ordered linked list for a given alphabetic key or name.
6. (a) What is a stack? Write down the procedure for implementing various stack operations(8)
(b) Explain the various application of stack? (8)
7. (a) Given two sorted lists L1 and L2 write a procedure to compute $L1 \cap L2$ using only the basic operations (8)
(b) Write a routine to insert an element in a linked list (8)
8. What is a queue? Write an algorithm to implement queue with example.

Unit III- TREES

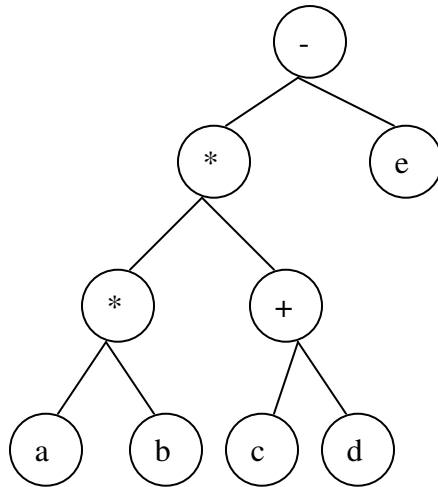
PART – A (2 MARKS)

1. Explain Tree concept?
2. What is meant by traversal?
3. What is meant by depth first order?
4. What is In order traversal?
5. What is Pre order traversal?
6. What is Post order traversal?
7. Define Binary tree.
8. What is meant by BST?
9. Define AVL trees.
10. Give example for single rotation and double rotation.
11. Define Hashing.
12. Define Double Hashing.
13. What is meant by Binary Heap?
14. Mention some applications of Priority Queues.
15. Define complete binary tree.
16. How a binary tree is represented using an array? Give an example
17. A full node is a node with two children. Prove that the number of full nodes plus one is equal to the number of leaves in a non empty binary tree.
18. Define (i) inorder (ii) preorder (iii) postorder traversal of a binary tree.
19. Suppose that we replace the deletion function, which finds, return, and removes the minimum element in the priority queue, with find min, can both insert and find min be implemented in constant time?
20. What is an expression tree?

21. What is binary search tree?

PART- B (16 MARKS)

1. Explain the operation and implementation of Binary Heap.
2. Explain the implementation of different Hashing techniques.
3. Give the prefix, infix and postfix expressions corresponding to the tree given in figure.



4. (a) How do you insert an element in a binary search tree? (8)
 (b) Show that for the perfect binary tree of height h containing $2^{h+1}-1$ nodes, the sum of the heights of the nodes $2^{h+1}-1-h(h+1)$. (8)
5. Given input $\{4371,1323,6173,4199,4344,9679,1989\}$ and a hash function $h(X)=X(\text{mod}10)$, show the resulting:
 - (a) Separate chaining table (4)
 - (b) Open addressing hash table using linear probing (4)
 - (c) Open addressing hash table using quadratic probing (4)
 - (d) Open addressing hash table with second hash function $h_2(X) = 7-(X \text{ mod } 7)$. (4)
6. Explain in detail (i) Single rotation (ii) double rotation of an AVL tree.
7. Explain the efficient implementation of the priority queue ADT
8. Explain how to find a maximum element and minimum element in BST? Explain detail about Deletion in Binary Search Tree?

Unit IV - SORTING
PART – A (2 MARKS)

1. What is meant by sorting?
2. Mention the preliminaries of sorting.
3. What are the types of sorting?
4. What is the difference between bubble sort and selection sort?
5. Give example for insertion sort.
6. Mention the Running time for insertion sort.
7. What is meant by heap sort?
8. What is meant by Quick sort?
9. What is the advantage of Quick sort over Merge sort?
10. Mention the Best case n worst care of the quick sort.
11. What is meant by external sorting?
12. Determine the average running time of quick sort.
13. Trace the steps of insertion sort – 12,19,33,26,29,35,22. Find the total number of comparison made.
14. What is the principle of radix sort?
15. What is insertion sort?
16. What is shell sort?
17. Define the worst case analysis of shell sort
18. What is merge sort?
19. What is meant by external sorting?
20. What is multiway merge?

PART -B (16 MARKS)

1. Sort the sequence 3, 1, 4,7,5,9,2,6,5 using Insertion sort.
2. Explain the operation and implementation of Insertion sort and shell sort.
3. Explain the operation and implementation of merge sort.
4. Explain the operation and implementation of external sorting.
5. (a) Write quick sort algorithm and explain. (10)
(b) Trace the quick sort algorithm for the following list of numbers.
90,77,60,99,55,88,66 (6)

6. Write down the merge sort algorithm and give its worst case, best case and average case analysis.
7. Show how heap sort processes the input 142,543,123,65,453,879,572,434,111,242,811,102.

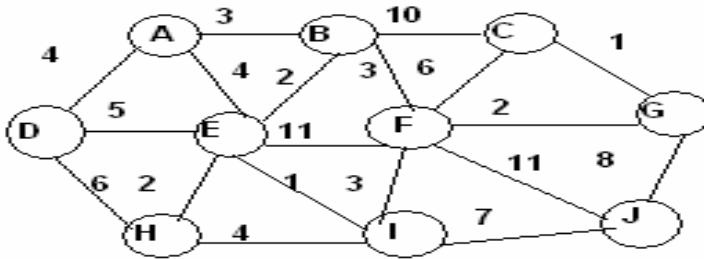
Unit V - GRAPHS
PART – A (2 MARKS)

1. Define Graph.
2. What is meant by directed graph?
3. Give a diagrammatic representation of an adjacency list representation of a graph.
4. What is meant by topological sort?
5. What is meant by acyclic graph?
6. What is meant by Shortest Path Algorithm?
7. What is meant by Single-Source Shortest path problem?
8. What is meant by Dijkstra's Algorithm?
9. What is minimum spanning tree?
10. Mention the types of algorithm.
11. Define NP- complete problems
12. What is space requirement of an adjacency list representation of a graph
13. What is topological sort?
14. What is breadth-first search?
15. Define minimum spanning tree
16. Define undirected graph
17. What is depth-first spanning tree
18. What is Bio connectivity?
19. What is Euler Circuit?
20. What is a directed graph?
21. What is meant by 'Hamiltonian Cycle'?
22. Define (i)indegree (ii)outdegree

PART - B (16 MARKS)

1. Explain Prim's & Kruskal's Algorithm with an example.
2. Describe Dijkstra's algorithm with an example.
3. Explain how to find shortest path using Dijkstra's algorithm with an example.
4. Explain the application of DFS.

5. Find a minimum spanning tree for the graph



using both Prim's and Kruskal's algorithms.

6. Explain in detail the simple topological sort pseudo code
7. Write notes on NP-complete problems