Gateway Classes

Question bank (Most Important Questions)

DATA-STRUCTURE (BCS-301)

Unit-1

1. Differentiate between linear and non-linear data structure with example.

2. Define time–space tradeoff with example.

3. Explain various asymptotic notations.

4. Define ADT with example. Also explain best case, worst case and average case analysis of algorithms.

5. Numericals based on array address calculation formula in 1-D, 2-D, 3-D array in row-major and col-major order. **{Very Important}**

6. Define sparse matrix and their representations.

7. Write C functions of all operations on a singly linked list.

8. Write C programs of all operations on doubly linked list.

9. How to represent polynomial using linked list? Construct algorithm/program to add two polynomials using linked list. **{Very Important}**

10. Write C program to implement operations on circular linked list.

Unit-2

1. Write a C program to implement all operations of a stack using array.

2. Write a C program to implement all operations of a stack using linked list. **{Very Important}**

3. Write algorithm to convert infix to postfix expression using stack. Trace algorithm to convert the following: A + (B * C – (D / E ^ F) * G) * H

4. Write an algorithm to evaluate an arithmetic expression using stack and explain with example.

5. What is recursion? Explain tail recursion with example. Programs on –
   a) Factorial using recursion   b) Fibonacci series using recursion **{Very Important}**

6. Explain Tower of Hanoi problem and write a recursive algorithm to solve it.

7. Write a program to implement all operations of linear queue using array/linked list.

8. What is circular queue? How circular queue removes the drawback of linear queue? Write the conditions for empty and full circular queue.

9. Define priority queue. Give one application of priority queue.

Unit-3

1. Differentiate between
   a) Stable / Unstable sorting with example
   b) Internal / External sorting.

2. Write algorithm for merge-sort and apply on the following to sort them in ascending order: 11, 16, 13, 11, 4, 12, 6, 7
   Also give time and space complexity.

3. Write Quick sort algorithm and use it to sort the following in ascending order. Also write time and space complexity of Quick sort: 25, 57, 48, 37, 12, 92, 86, 33

4. Write heap sort algorithm. Sort the following: 18, 25, 45, 34, 36, 51, 43, 24.

5. Differentiate between linear search and binary search. Write a recursive function to implement binary search.
   Apply binary search to find 40 in ⇒   11, 22, 30, 33, 40, 44, 55, 60, 66, 77, 80, 88, 99
   Also discuss its time complexity.

6. What is hashing? Explain different forms of hashing with example. Differentiate between linear and quadratic probing.   **{Very Important}**

7. Construct a hash table that contains 15 buckets and uses linear probing with h(K) = K mod 10.The keys are: 12, 17, 13, 2, 5, 43, 6, 85

8. What do you mean by collision in hashing? Discuss two types of collision resolution techniques.

Unit-4

1. Define binary tree, full binary tree, strict binary tree, complete binary tree and extended binary tree with example.

2. Construct a binary tree with following traversals:

   a) In-order – B C A E G D H F I J

          Pre-order – A B C E O G H I J

   b) In-order – B I D A C E G H F

          Post-order – I D B G C H F E A

3. Define binary search tree. What is the difference between BST and binary heap? For given sequence of numbers, construct BST and heap:
   34, 23, 67, 45, 12, 54, 87, 43, 98, 75, 84, 93, 31

4. What is AVL tree? Explain various rotations performed to balance an AVL tree with example. Construct AVL tree by inserting:
          60, 2, 14, 22, 13, 111, 92, 86
                         into initially empty AVL tree.

5. Demonstrate B-Tree. Write its properties.
   Insert: F, S, B, K, C, L, H, T, V, O, M, R, N, P, A,
   Bin order into initially empty B-Tree.

6. Illustrate the significance of threaded binary tree.

7. Explain Huffman coding with example.

Unit-5

1. Explain the following graph terminologies with example:

    (i) Graph

    (ii) Weighted Graph

    (iii) Degree of a vertex

    (iv) Connected / Disconnected graph

    (v) Cycle in a graph

    (vi) Directed / Undirected graph

    (vii) Complete graph

2. Explain adjacency matrix and adjacency list representation of a graph.

    {Very Important}

3. Explain DFS with example.

4. Explain BFS with example.

5. What is spanning tree? What is MST?   **{Very Important}**

    Write Prim's and Kruskal's algorithms to find MST from a given graph.

    Any graph would be given — — —

6. Apply Explain and write Dijkstra's algorithm for shortest path in a graph, and find the shortest path in the given graph.
    Any graph would be given — — —

7. Write Floyd–Warshall's algorithm and find shortest path among all the vertices.
    Any graph — — —