BACHELOR OF TECHNOLOGY (CBCS - 2023)
B. Tech. Sem-III INFORMATION TECHNOLOGY : SUMMER : 2025
SUBJECT: DATA STRUCTURES

Day : Wednesday
Date : 14/05/2025

S-29247-2025

Time : 02:30 PM-05:30 PM
Max. Marks : 60

N.B.

1) All questions are **COMPULSORY.**
2) Figures to the right indicate **FULL** marks.
3) Draw neat and labeled diagrams, **WHEREVER** necessary.
4) Assume suitable data, if necessary.

Q.1 Compare and contrast linear and non-linear data structures. Provide suitable examples where each type is preferred. **[10]**

OR

Q.1 Explain the concept of recursion in algorithms. Write a pseudo code for recursive algorithm to compute the factorial of a number and discuss its time complexity. **[10]**

Q.2 Describe how stack can be realize using an array. Write the pseudo code for the push and pop operations. Discuss the advantages and disadvantages of using an array based implementation for stack. **[10]**

OR

Q.2 Explain the concept of priority queue. How does it differ from a regular queue? Discuss the two common types of priority queues (min-heap and max-heap) and their applications. **[10]**

Q.3 Explain the concept of linked organization data structures. How does a linked list differ from a sequential organization like an array? Discuss the advantages and disadvantages of each. **[10]**

OR

Q.3 Write a pseudo code to create node and search in a single link list. **[10]**

Q.4 Write an algorithm to delete an element x from a binary search tree t. What is the time complexity of your algorithm? **[10]**

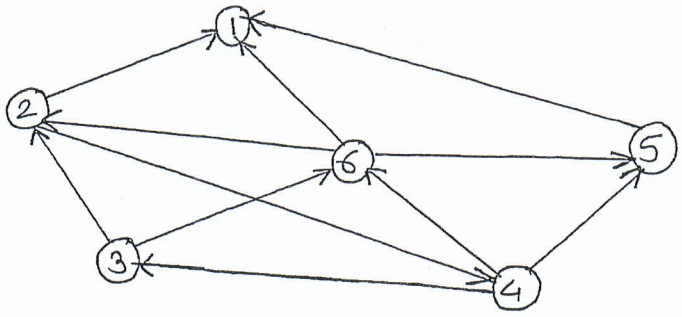
OR

Q.4 Present an algorithm to start with an initially empty binary search tree and make n random insertions. Use a uniform random number generator to obtain the values to be inserted. **[10]**

P.T.O.

Q.5 For the digraph shown below obtain: [10]

a) The in-degree and out-degree of each vertex.
b) Its adjacency – matrix representation.
c) Its adjacency – list representation.
d) Its adjacency – multilist representation.
e) Its strongly connected components



OR

Q.5 Draw the complete undirected graphs on one, two, three, four and five vertices. Prove that the number of edges in an n-vertex complete graph is $n \times (n-1)/2$. Assume G be an undirected, connected graph with at least one vertex of odd degree. [10]

Q.6 Discuss the problem of hash table overflow. How can it be handled, and what are the potential drawbacks of these approaches? [10]

OR

Q.6 What is sequential file organization? Explain how records are stored in a sequential file and discuss the merits and demerits of this method. [10]

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