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Question Paper Code : 20010

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Second Semester

Artificial Intelligence and Data Science

AD 3251 – DATA STRUCTURES DESIGN

(Common to : Computer Science and Business Systems)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define data structures and how the data types are classified at the higher level.
2. What is recursion in data structure?
3. Find the Abstract Data Type in linked lists that has no NULL links, Justify.
4. List the applications of Stack ADT concerning computing systems.
5. What is recurrence for the worst case of QuickSort and what is the time complexity in the Worst case?
6. What is the load factor in data structure?
7. What is the difference between tree depth and height?
8. Define Heap in Data Structures. What are the properties of a heap?
9. Find the number of edges present in a complete graph having n vertices.
10. Define Complete Graph and Finite Graph.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the Asymptotic Notations in detail and their types with a suitable example program. (8)

(ii) Write a short note on the namespace in python and its types. (5)

Or

(b) (i) Discuss the shallow and deep copying and differentiate its pros and cons. (8)

(ii) Explain in short about python classes and objects. (5)

12. (a) (i) Write a program to traverse a doubly linked list using only one space for the address field with every node. (8)

(ii) Explain the list ADT with an example. (5)

Or

(b) (i) What is stack ADT and what are the various operations on Stack? Write the python program to perform its operation. (8)

(ii) What is Queue ADT and what are the various operations on Queue? (5)

13. (a) (i) Suppose we are sorting an array A[2 5 1 7 9 12 11 10] using Bubble sort. Give all the steps while sorting the array. What is the best and worst case time complexity of Bubble sort? (8)

(ii) Define hash function. How will you calculate the hash function using division. (5)

Or

(b) (i) Suppose we are sorting an array A[5 4 1 10 18 15 11] using Insertion sort. Give all the steps while sorting the array. Calculate its best time and worst time complexity based on the given example. (8)

(ii) Derive the time complexity of the quick sort algorithm. (5)

14. (a) The inorder and preorder traversal of a binary tree are “D B E A F C G” and “A B D E C F G”, respectively. What would be the postorder traversal of the binary tree? Illustrate the steps. (13)

Or

(b) Discuss about the AVL trees along with it's properties and advantages with suitable example. (13)

15. (a) The adjacency matrix of a four-vertex graph is shown in below figure. List the sequence of nodes visited starting from vertex 4, in depth-first search on the graph. (13)

-	A	B	C	D
A	0	1	0	0
B	1	0	1	0
C	0	1	0	1
D	0	0	1	0

Or

(b) Discuss in detail about the tree traversal with a suitable example and explain various tree traversals methods. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Convert the given postfix expression ABC*+D/E-FQ* into a prefix and infix expressions and explain the procedure in detail. Illustrate the steps. (15)

Or

(b) Consider the given undirected graph and apply Kruskal's Algorithm to find the minimum spanning tree. Illustrate the steps. (15)

