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Question paper Code: X11320

B.E./B.Tech. DEGREE EXAMINATIONS APRIL / MAY 2021

Second Semester

Artificial Intelligence and Data Science

AD8251 - DATA STRUCTURES DESIGN

(Common to Computer Science and Business System)

(Regulations 2017)

Time : 3 Hours

Answer ALL Questions

Max. Marks 100

PART-A (10 x 2 = 20 Marks)

1. How to convert a singly linked list to circular list?
2. What is analysis of recursive algorithms?
3. Name the best method of implementing a stack (array/ pointer/ cursor) and give justification.
4. Illustrate the unique feature of double-ended queue.
5. Give a situation when quick sort is better than bubble sort.
6. Illustrate collision during hashing.
7. Give the balance factor of an AVL tree.
8. What is the advantage of using multiway search tree?
9. What is topological ordering in graph data structure?
10. What is the necessity of shortest path algorithm?

Part – B (5 x 13 = 65 marks)

11. a) A click counter is a small hand-held device that contains a push button and a count display. To increment the counter, the button is pushed and the new count shows in the display. Clicker counters also contain a button that can be pressed to reset the counter to zero. Design and implement the Counter ADT that functions as a hand-held clicker. (13)
- OR**
- b) Design and implement a TimeDate ADT that can be used to represent both a date and time as a single entity. (13)

12. a) Write and test a program that extracts postfix expressions from the user, evaluates the expression, and prints the results. You may require that the user enter numeric values along with the operators and that each component of the expression be separated with white space. (13)

OR

- b) Design and implement a function that evaluates a prefix expression stored as a text string. (13)

13. a) Given the following list of keys (3, 18, 29, 32, 39, 44, 67, 75), explain the formal algorithms and show the contents of the array after each iteration of the outer loop for the (i) bubble sort (ii) selection sort. (13)

OR

- b) Explain the insertion sort algorithm and evaluate it to determine the best case and the worst-case time complexities using an appropriate example. (13)

14. a) Consider the following set of values and use them to build a heap by adding one value at a time in the order listed: 30 63 2 89 16 24 19 52 27 9 4 45 (i) min-heap (ii) max-heap. Also explain the differences in the approach of these two algorithms using appropriate code snippets. (13)

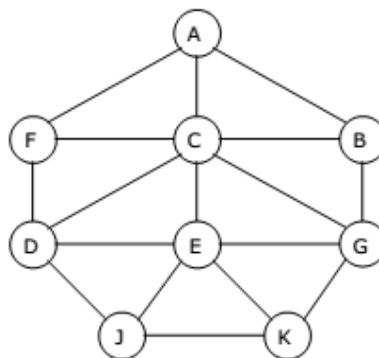
OR

- b) Consider the following set of values and use them to build the indicated type of tree by adding one value at a time in the order listed: 30 63 2 89 16 24 19 52 27 9 4 45 (i) binary search tree (ii) AVL tree. Give an explanation when there is a change in the root nodes. (13)

15. a) Explain the different types of Minimum Spanning Tree algorithm and their properties using appropriate example. (13)

OR

- b) Elaborate all possible types of the graph traversals that could be made in the following graph: (13)



PART C (1 X 15 = 15)

16. a) Design and implement a function to find all negative values within a given list. Your function should return a new list containing the negative values. When does the worst case occur and what is the run time for that case? (15)

OR

- b) Prove or show that the worst case time of the extraction operation on a heap implemented as an array is $O(\log n)$. (15)