Register Number:……..

KUMARAGURU
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**B.E DEGREE EXAMINATIONS: APRIL /MAY 2024**

(Regulation 2018)

Sixth Semester

**ELECTRICAL AND ELECTRONICS ENGINEERING**

U18CSI6211**:** Data Structures and Algorithms

**COURSE OUTCOMES**

**CO1:** Develop simple algorithms for solving problems
**CO2:** Explain the basic data structures and its operations.
**CO3:** Explain basics of hashing and solve problems using trees
**CO4:** Summarize various searching and sorting algorithms.
**CO5:** Make use of graph-based algorithms to solve problems
**CO6:** Explain the concept of time complexity and space complexity.

**Time: Three Hours** **Maximum Marks: 100**

**Answer all the Questions:-**
**PART A (10 x 2 = 20 Marks)**
**(Answer not more than 40 words)**

| | | | |
|---|---|---|---|
| 1. | Outline top-down design methodology. | CO1 | [$K_2$] |
| 2. | How to terminate a loop? Give an example. | CO1 | [$K_2$] |
| 3. | What is the use of ADT in data structures? | CO2 | [$K_2$] |
| 4. | Interpret enqueue operation with an algorithm. | CO2 | [$K_3$] |
| 5. | Calculate the height of the binary tree given below in Figure 1. | CO3 | [$K_3$] |

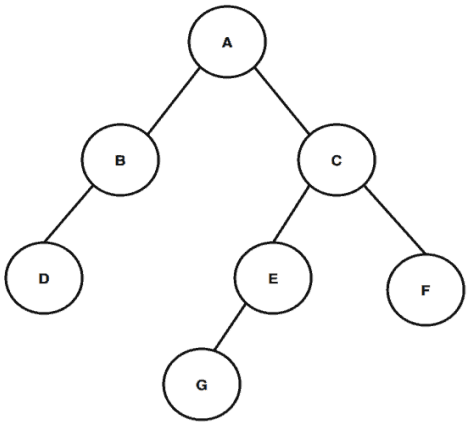


Figure 1

6. Why is a binary heap also considered as a priority queue? Explain. CO3 [$K_2$]

7. State the merits and demerits of insertion sort algorithm. CO4 [$K_2$]

8. How to select a pivot element in quick sort? Mention its significance in sorting. CO4 [$K_2$]

9. What is a graph? Mention its applications. CO5 [$K_2$]

10. Identify the average case execution time complexity for the following data structure and its operations. CO6 [$K_3$]

| Data structure/operation | Queue | Singly Linked List |
|---|---|---|
| Insert | | |
| Delete | | |

**Answer any FIVE Questions:-**
**PART B (5 x 16 = 80 Marks)**
**(Answer not more than 400 words)**

11. a) What is the problem solving strategies used in general in data structures? Explain any two. 8 CO1 [$K_2$]

    b) How to find the sum of N numbers? Explain the algorithm development process and write the algorithm description. 8 CO1 [$K_3$]

12. a) How to insert and delete an element from a stack? Explain with a pseudocode. 8 CO2 [$K_2$]

    b) Demonstrate any two operations of doubly linked list with a C code. 8 CO2 [$K_2$]

13. a) What is Hashing? Illustrate the hashing concept and components with a suitable diagram. Explain any one collision resolution technique used in hashing with a suitable example. 10 CO3 [$K_2$]

    b) State the advantage of tree traversal in data structures. Apply In-order and Pre-order tree traversals for the tree given in Figure 2. 6 CO3 [$K_3$]

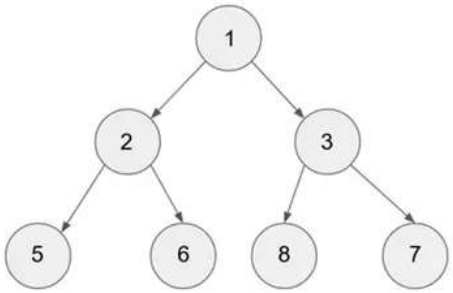


Figure 2

14. a) Construct max heap for the given unsorted array of elements: {10, 30, 5, 63, 22, 12, 56, 33}. 8 CO4 [K3]

b) What is the algorithmic paradigm of quick sort? Elucidate with an example. 8 CO4 [K2]

15. a) Explain Dijkstra's Algorithm with an example. Enlist its applications. 8 CO5 [K2]

b) What are basic conditions to be met to perform minimum spanning tree? How is Prim's algorithm used to find the minimum spanning tree? Explain with an example. 8 CO5 [K2]

16. a) What is time and space complexity? Fill in the table given below. 8 CO6 [K3]

| Data structure | Time complexity (Best case) | Space complexity (Best case) |
|---|---|---|
| Singly linked list – Insertion at the beginning | | |
| Singly linked list – Insertion at the end | | |
| Singly linked list – Insertion at given position | | |
| Singly linked list – Searching of an element | | |

b) Complete the time and space complexity table for the sorting algorithms given below. 8 CO6 [K3]

| Sorting algorithm | Time complexity (Best case) | Space complexity (Best case) |
|---|---|---|
| Heap | | |
| Quick | | |
| Merge | | |
| Shell | | |

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