



B.E DEGREE EXAMINATIONS: APRIL / MAY 2023

(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. Define the different problem-solving aspects of simple algorithms. | CO1 | [K ₁] |
| 2. Label the schematic breakdown of a problem into subtasks, as employed in top-down design. | CO1 | [K ₁] |
| 3. List any four tree terminologies with an example. | CO3 | [K ₁] |
| 4. Illustrate the structure of a strictly binary tree and a perfect binary tree. | CO3 | [K ₂] |
| 5. Name the factors affecting the suitability of a sorting technique. | CO4 | [K ₁] |
| 6. How many passes are performed by the insertion sort for the sequence (18, 3, 2, 33, and 21)? | CO4 | [K ₂] |
| 7. Recall the two main steps involved in the topological sort algorithm. | CO5 | [K ₁] |
| 8. Match the graph given in Figure 8 with the weight matrix to find the shortest path. | CO5 | [K ₂] |

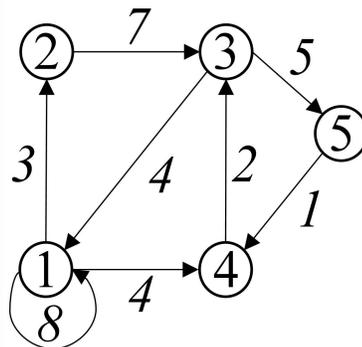


Figure 8: Graph for weight matrix

9. What are the possible minimum spanning trees for an unweighted graph shown in Figure 9? CO5 [K₁]

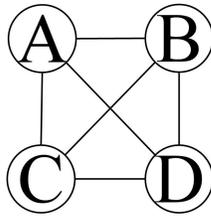


Figure 9: Unweighted graph for minimum spanning trees

10. Find the time complexity of pre-order, in-order, and post-order traversal sequences for the tree. CO6 [K₁]

**Answer any FIVE Questions: -
PART B (5 x 4 = 20 Marks)
(Answer not more than 80 words)**

11. Apply the top-down design for relating various parts of the program to implement simple algorithms. CO1 [K₃]
12. Explain the different operations of data structures using abstract data types. CO2 [K₂]
13. Compare the hash function with binary search techniques used in different programming situations. CO3 [K₂]
14. Explain the heap structure to sort a list of integers with a code. CO4 [K₂]
15. Identify the steps to execute Dijkstra's algorithm for the graph shown in Figure 15 with the assumption of 'D' as the initial node. CO5 [K₃]

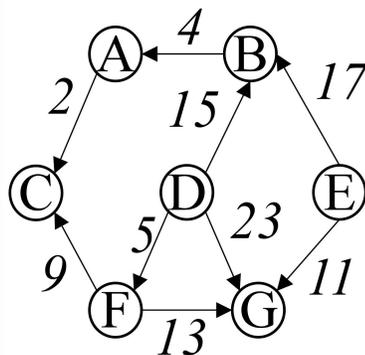


Figure 15: Dijkstra's algorithm Steps

16. Summarize the verification of program segments with space complexity in branches and loops. CO6 [K₂]

Answer any FIVE Questions: -
PART C (5 x 12 = 60 Marks)
(Answer not more than 300 words)

17. a) Develop redundant computations and reference array elements to improve the efficiency of simple algorithms. 6 CO1 [K₃]
 b) Make use of computational complexity and order notation to assess the performance of simple algorithms. 6 CO1 [K₃]
18. a) Outline the two tasks involved in the implementation of a linked list with suitable code. 6 CO2 [K₂]
 b) Relate the stack operations with array implementation and linked implementation with suitable code. 6 CO2 [K₂]
19. a) Rephrase the priority queue shown in Figure 14 after the insertion of two new nodes with general rules for processing the elements. 6 CO3 [K₂]

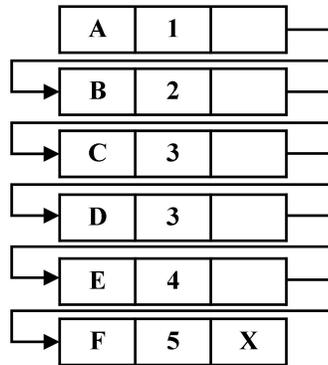


Figure 19: Priority queue

- b) Build a Max heap H from the given set of numbers: 45, 36, 54, 27, 63, 72, 61, and 18 with memory representation. 6 CO3 [K₃]
20. a) Summarize the algorithm used to perform merge sort on an array of integers. 6 CO4 [K₂]
 b) Construct a program to perform a quick sort on an array of N elements. 6 CO4 [K₃]
21. a) Construct a minimum spanning tree of the graph given in Figure 21a using Prim's algorithm from vertex D. 6 CO5 [K₃]

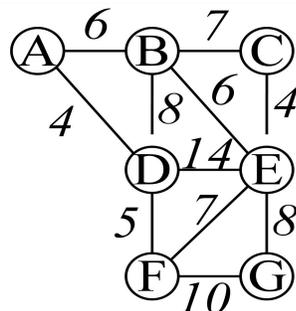


Figure 21a: Prim's algorithm for minimum spanning tree

- b) Explain the different NP-complete problems related with data structures. 6 CO5 [K₃]
22. a) Demonstrate the insert and delete operations of a circular queue with suitable code. 6 CO2 [K₂]
- b) Explain the space and time complexity of external sorting. 6 CO6 [K₂]
