



P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, Master of Computer Applications (MCA)

Semester End Examination; October - 2022

Data Structures with Algorithm Analysis

Time: 3 hrs

Max. Marks: 100

Course Outcomes

The Students will be able to:

CO1: Apply the stack data structure for suitable real time applications.

CO2: Choose and implement the appropriate data structures to solve computational problems.

CO3: Understand the correctness of algorithm and efficiency of algorithms.

CO4: Analyze complexity of algorithms for different types of problems.

CO5: Design efficient algorithm using standard algorithms design techniques.

Note: I) Answer any FIVE full questions, selecting ONE full question from each unit.

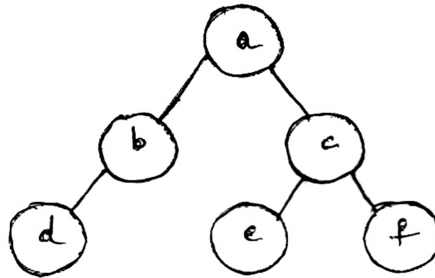
II) Any THREE units will have internal choice and remaining TWO unit questions are compulsory.

III) Each unit carries 20 marks.

Q. No.	Questions	Marks	BLs	COs	POs
UNIT - I		20			
1 a.	Write the algorithm for converting the Infix expression to Postfix expression. Use the same to transform the following infix expression into postfix expression $((A-(B+C))*D)^(E+F)$.	10	L2	CO1	PO1,2,4
b.	Explain the working of a stack data structure to implement the PUSH, POP and DISPLAY functions using stack of arrays.	6	L2	CO1	PO1,2,3
c.	Write the C program for solving towers of Hanoi using recursion.	4	L3	CO1	PO1,2,3,5
UNIT - II		20			
2 a.	Analyze the pros and cons of representing a group of items as an array versus a linear linked list.	5	L1	CO2	PO2
b.	Write the C code to implement Queue using linked list.	10	L3	CO2	PO1,2,3,4
c.	Explain in detail, what is a node and its logical representation (program representation or structural representation) of a node of a double linked list.	5	L3	CO2	PO1,2,3,4
UNIT - III		20			
3 a.	Develop Pseudo code to find GCD of (m, n) using Euclid's method. Apply it to find GCD (10, 20).	5	L2	CO3	PO1,2,3,5
b.	List and explain any five basic asymptotic efficiency classes.	10	L2	CO3	PO1,2,3
c.	Describe brute-force approach. What are the advantages and disadvantages of this approach?	5	L2	CO3	PO1,2,3

OR

- 3 d. Discuss the following binary tree traversals,
 i) Preorder ii) In order
 iii) Post order, state the three traversal techniques for the given binary tree



10 L1 CO3 PO1,2,3,5

- e. Write the algorithm for Bubble sort. State its time complexities in best case and worst case.
 f. Find the number of a character comparisons that will be made by string matching for the pattern ABABC in the following text: BAABABABCCA

5 L3 CO3 PO1,2,3

5 L3 CO3 PO1,2,3

UNIT - IV

20

- 4 a. Write the algorithm for the following:
 i) Insertion sort ii) Breadth first search
 b. Define AVL trees. Draw an AVL tree of height 4 that contains the minimum possible number of nodes.

10 L3 CO4 PO2,3,4

10 L2 CO4 PO1,2,3

OR

- 4 d. Write the algorithm for Comparison Counting Sort and trace it to sort the array of 62, 31, 84, 96, 19, 47.
 e. Describe the purpose of Johnson Trotter algorithm. Write Johnson Trotter algorithm. Generate the permutations for input 4 using Johnson Trotter algorithm.

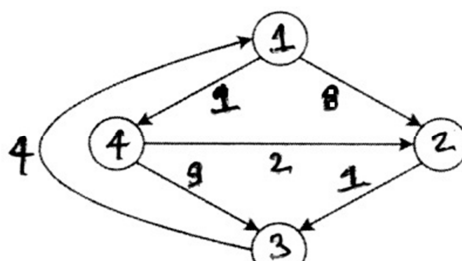
10 L1 CO4 PO1,2,3

10 L1 CO4 PO1,2,3

UNIT - V

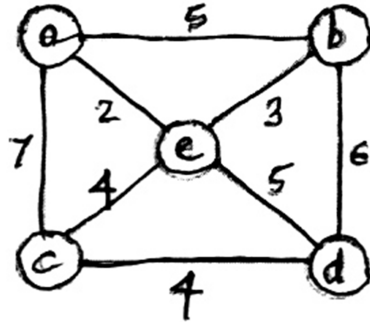
20

- 5 a. Write the Floyd's algorithm for the shortest path problems. Implement a Floyd's path algorithm on the given graph and trace the algorithm to find the shortest path in the graph shown in Fig. Q5(a).



10 L3 CO5 PO1,2,3,5

- b. Define the minimum spanning tree problem. Apply Prim's algorithm to the following graph. Include the priority queue all the vertices not already in the tree.

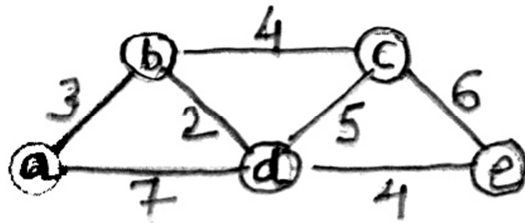


10 L1 CO5 PO1,2,3,4

OR

- 5 d. Demonstrate Warshall's algorithm for transitive closure.
 e. Write Dijkstra's algorithm and apply the same for the following graph to find the shortest path.

10 L3 CO5 PO1,2,3,4



10 L3 CO5 PO1,2,3,5

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