U.S.N | | | | | | | | | | |

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 - 2023

Data Structures with Algorithms

Time: 3 hrs *Max. Marks: 100*

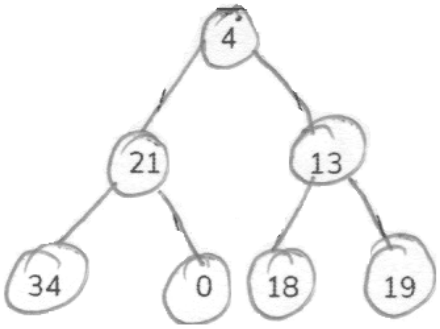
Course Outcomes

The Students will be able to:
CO1: Apply the data structures for suitable real time applications.
CO2: Choose and implement the appropriate data structures to solve computational problems.
CO3: Discuss the basic concepts of algorithms.
CO4: Design and develop efficient algorithm for a given problem.
CO5: Determine complexity of algorithms for different types of problems.

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
1 a.	Define stack. Explain the operations of stacks with code snippet.	10	L1, 2	CO1	PO1,2,3
b.	Convert the following expressions from infix to suffix expression; i) A + B – C * D ii) (A+B)*(C+D)$(A+B) iii) (A+B)*C	6	L2	CO1	PO1,2,4
c.	Develop recursive C function to search a number using binary search technique.	4	L3	CO1	PO1,2,3,5
2 a.	Present C code to insert and delete an element from the front of singly linked list and delete an element from the end of singly linked list.	10	L2	CO2	PO1,2,3
b.	Illustrate the operations of circular queue with an example and write 'C' program to perform those operations.	10	L2	CO2	PO2
3 a.	Briefly discuss about algorithm. Explain the steps involved in algorithm design and analysis process with neat diagram.	10	L1,2	CO3	PO2
b.	Design an algorithm to sort given set of numbers using Bubble sort. Analyze the algorithm.	10	L6	CO3	PO1,2,3,5
	OR				
d.	Present about brute force string matching algorithm. Write best and worst case time complexity.	10	L6	CO3	PO1,2,3
e.	Design the C code to traverse the binary tree in in-order, pre-order, and post-order and traverse the given tree in all the three forms.	10	L6	CO3	PO1,2,3

Contd….2



4 a.	Discuss in detail about Topological order with example.	10	L3	CO4	PO1,2,3,4
b.	Explain sorting by counting with suitable algorithm. Trace the algorithm to sort the numbers given: 25, 42, –4, 56, 0, 10, 31.	10	L2,4	CO4	PO1,2,3,4

OR

d.	Develop an algorithm to insert an element into AVL tree and construct an AVL tree for the items 1, 2, 3, 4, 5, and 6.	10	L3	CO4	PO1,2,3,4
e.	Design pseudo code to traverse the graph using DFS method. Traverse the graph given in Fig. Q4(e) starting from the node H. Construct appropriate DFS tree.	10	L6	CO4	PO1,2,3,5

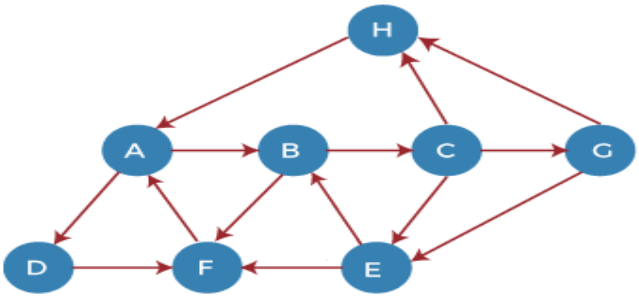


Fig.:Q4(e)

5 a.	Design Prim's algorithm and apply the same to find minimum cost spanning tree for the graph in Fig. Q5(a)	10	L6	CO5	PO1,2,3,5

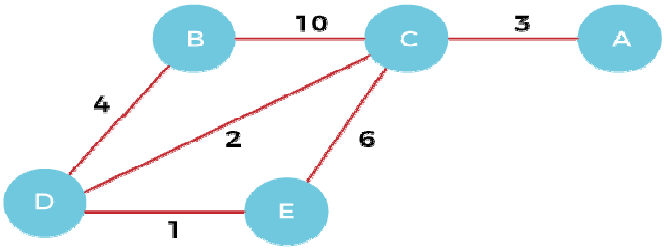


Fig. Q5a

b.	Discuss the Knapsack problem by dynamic programming with respect to the following example capacity w =5. Find the optimal solution for the 0/1 knapsack problem making use of dynamic programming approach.	10	L6	CO5	PO1,2,3,5

Contd....3

Item	Weight	Value
1	2	3
2	3	4
3	4	5
4	5	6

OR

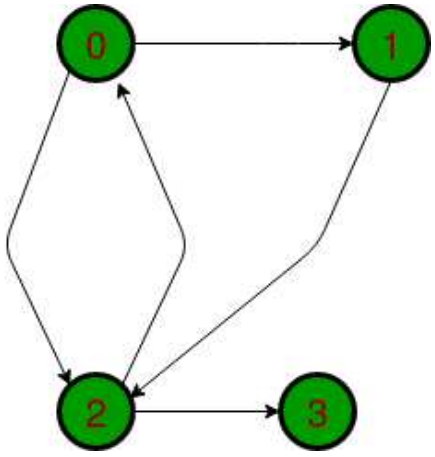
d. Construct Huffman tree for the following:

Character	A	B	C	D	-
Probability	0.35	0.1	0.2	0.2	0.15

10 L6 CO5 PO1,2,3,5

Encode DAD and Decode 10011011011101.

e. Design Warshall's algorithm for computing transitive closure. Apply the algorithm for the following diagraph (Fig. Q5(e)).



10 L6 CO5 PO1,2,3,5

Fig.Q5(e)

* * * *