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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Third Semester, B.E. - Information Science and Engineering
Semester End Examination; Dec. - 2019
Data Structures and Algorithms

Time: 3 hrs   Max. Marks: 100

Note: i) **PART - A** is compulsory. **Two** marks for each question.
    ii) **PART - B**: Answer any **Two** sub questions (from a, b, c) for Maximum of **18 marks** from each unit.

Q. No.	Questions	Marks
	I : PART - A	**10**
I a.	Write a recursive function to find factorial of given number.	2
b.	What is the circular queue_full and queue_empty condition?	2
c.	Write two advantages of linked lists over arrays.	2
d.	Using tree concept, draw an almost complete binary tree and complete binary tree at level 2.	2
e.	Write the algorithm for heap sort technique.	2
	II : PART - B	**90**
	UNIT - I	**18**
1 a.	Write a C program to convert a given fully parenthesized infix expression to postfix expression and convert the given infix expression to postfix with stack to trace. $((A-(B+C)*D)*(E+F))$	9
b.	Define stack implement push and pop operations for stack using arrays with a stack full and stack empty conditions.	9
c.	List the advantages of recursion. Write an algorithm for the Tower of Hanoi problem. Show the trace for $n = 4$ disks.	9
	UNIT - II	**18**
2 a.	Develop C functions to perform the following on a singly linked list; i) Insert in linked list ii) Delete node in linked list based on position iii) Display nodes in linked list	9
b.	Write C function to perform to perform following operations using doubly linked list: i) Insert a new node to the left of a given node ii) To delete a given node from the list	9
c.	What are the different functions to allocate and de-allocate memory dynamically? Explain with proper syntax and an example.	9

UNIT - III 18

3 a. What is a priority queue? Write the function module to insert and delete elements from the priority queue. 9

b. Implement the following double ended queues.

  i) Input restricted double ended queue

  ii) Output restricted double ended queue 9

c. Design a code to reverse a single linked list and merge two singly linked lists. 9

UNIT - IV 18

4 a. With diagram, explain the following tree types :

  i) Binary tree

  ii) Complete binary tree

  iii) Full binary tree 9

b. Explain the different tree traversal techniques with a tree of your choice with minimum levels 4. 9

c. Develop a C program to construct a binary tree for a given arithmetic expression in Postfix representation. Assume all the operators are of type binary. 9

UNIT - V 18

5 a. What is radix sort? Explain with an example. Write the C program to implement radix sort. 9

b. With an example, explain heap data structure. How to heapify a tree? Write a note on application of Heap sort. 9

c. Write a C program to implement address calculation sorting technique. 9

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