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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; March / April - 2022
Data Structures and Algorithms

Time: 3 hrs   *Max. Marks: 100*

Course Outcomes

The Students will be able to:

CO1: Understand primitive and derived data structure and Understand Abstract data types, Stacks and recursion.

CO2: Develop and implement linked list.

CO3: Develop programs to implement different queues.

CO4: Understand and create trees.

CO5: Design an algorithm to Sorting Techniques and Searching techniques.

<u>*Note:*</u> *I) PART - A is compulsory. **Two** marks for each question.*

   *II) PART - B: Answer any <u>Two</u> sub questions (from a, b, c) for Maximum of **18 marks** from each unit.*

Q. No.	Questions	Marks	BLs	COs	POs
	I : PART - A	**10**			
I a.	Mention any two applications of stack.	2	L1	CO1	PO1
b.	Differentiate between static memory and dynamic memory allocation. Give an example for each.	2	L3	CO2	PO1
c.	Mention any two applications of queue.	2	L1	CO3	PO1
d.	Define a Binary search tree.	2	L1	CO4	PO1
e.	Define a Heap. Which data structure is used in implementing it?	2	L1	CO5	PO1
	II : PART - B	**90**			
	UNIT - I	**18**			
1 a.	Define a stack. Implement Push and Pop operations of stack. An error message to be displayed for stack full ( ) and stack empty ( ) conditions. Also display the contents of stack when prompted by user. Assume stack size to be *N*.	9	L1,2	CO1	PO1
b.	Write an algorithm for conversion of infix expression into postfix expression and also convert the following expressions from infix to postfix; i) $(A + B) * C + D / (E + F * G) + H$ ii) $((A / B - C + D)) * (E - F) * G$	9	L3	CO1	PO1
c.	Write the recursive 'C' routines to implement the following: i) To find the sum of all digits in integer ii) To find X^n where *n* may be +Ve or –Ve iii) To find GCD of two numbers	9	L3	CO1	PO1

UNIT - II **18**

2 a. Using dynamic variables and pointer. Write a 'C' program to construct a SLL consisting of following info in each node:

Job_ID: integer; Job_name: string; Job_type: string

The operation to be supported are: **9 L2 CO2 PO3**

i) Front insert

ii) Specific node deletion based on Job_ID

iii) Displaying all the nodes in the list

b. Write a 'C' program using SLL to implement double ended queue. Handle queue empty condition **9 L2 CO2 PO1**

c. Implement the following functions on a single linked list: **9 L3 CO2 PO3**

i) Insert at end of list   ii) Delete front of list   iii) Delete at end of list

UNIT - III **18**

3 a. Using the circular linked list data structure, write a program to add two long positive integers. The list can have header node and numbers are entered in normal way. Each node in list contains a single digit of number. The number can be accepted as a string. **9 L2 CO3 PO2**

b. Define a priority queue. Implement in 'C' the priority queue. Also mention the applications of priority queue. **9 L1,3 CO3 PO3**

c. Write a program, using dynamic variables and pointers to perform the following operations:

i) Construct two ordered singly linked list in ascending order

ii) Merge these two lists into a single ordered list **9 L2,3 CO3 PO1**

UNIT - IV **18**

4 a. Define a binary search tree. Explain the tree traversal methods. How deletion is handled in BST? Explain with an example. **9 L1,2 CO4 PO1**

b. If the pre-order traversal of BST is 30, 20, 15, 5, 18, 25, 40, 35, 50, 45, 60. Determine its inorder traversal and postorder traversal. Draw the complete BST. **9 L3 CO4 PO1**

c. Write a 'C' program to evaluate a given expression (the operands of expression may all be assumed as single character integer variables. The value of which may be obtained from user separately) using an expression tree. **9 L2 CO4 PO3**

UNIT - V **18**

5 a. Define a Heap. Implement 'C' routine to create a Heap. Construct the max heap for the data 35, 33, 42, 10, 14, 19, 27, 44, 26, 31. **9 L1,3 CO5 PO1**

b. Write a 'C' program to implement address calculation sort. **9 L2 CO5 PO3**

c. Explain the 'C' routine of sentinel search with an example. **9 L2 CO5 PO1**

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