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PES University, Bangalore
(Established under Karnataka Act No. 16 of 2013)

UE18CS202

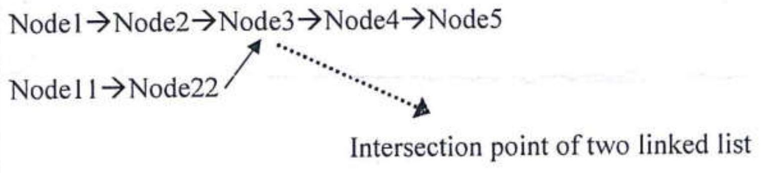
DEC 2019: END SEMESTER ASSESSMENT (ESA) B.TECH.III SEMESTER

UE18CS202: DATA STRUCTURES

Time: 3 Hrs　　Answer All Questions　　Max Marks: 100

NOTE: **C code should be given for implementation based questions. State any assumptions made.**

1.	a)	Write a recursive C function to count the number of nodes in a circular linked list where the address of first node in the linked list is given. Node structure definition is as follows
		struct node
		{
		  int data;
		  struct node* next;
		};
		typdef struct node node;
			3

	b)	Write a C function to find the node at which two sorted single linked lists intersect using stacks(linked list implementation) .Also find the counts of nodes in both the lists till the point of intersection.(Do not give code for stack functions (Push & Pop). Node structure definition is same as in question 1a)  Node1→Node2→Node3→Node4→Node5 Node11→Node22 Intersection point of two linked list	6
	c)	Given a sorted doubly linked list of positive distinct elements with two pointers head and tail pointing to first and last node respectively, write C function to find pairs in this list whose sum is equal to given value x, without using any extra space. Example: Input : head : 10<-> 20<-> 40<-> 50<-> 60 <-> 80<-> 90, x = 70 Output: (60, 10), (50,20)	6
	d)	Specify node structure for a sparse matrix represented using Multilists(linked representation).	5
2.	a)	Give C implementation of CONVERT_EVAL procedure which combines the features of EVAL and POSTFIX algorithm to evaluate an infix expression using two stacks (array implementation), one for operands and other for operators. Do not first convert infix string to postfix string and then evaluate but rather evaluate as you go along. Do not give code for stack functions. Trace the algorithm to evaluate the expression 4+5*3-2 (EVAL : Algorithm to evaluate a postfix expression POSTFIX: Algorithm to convert an infix expression to postfix expression)	10

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b) Given a queue (array implementation) of integers of even length, implement C function to interleave the first half of the queue with second half. Only a stack (array implementation) can be used as an auxiliary space.
Examples: Input : 10 20 30 40 Output : 10 30 20 40
Input : 11 12 13 14 15 16 17 18 19 20 Output : 11 16 12 17 13 18 14 19 15 20 — **6**

c) Explain how you can implement a queue using a circular singly linked list.
Show how you can do enqueue and dequeue operations without traversing the whole list. — **4**

3. a) Preorder traversal sequence of Tree T be 100; 34; 16; 9; 8; 38; 11; 4; 81 andpostorder traversal sequence be 34; 9; 11; 4; 38; 81; 8; 16; 100. If all the non-leaf nodes ofT have two children, identify T. Show all the steps — **4**

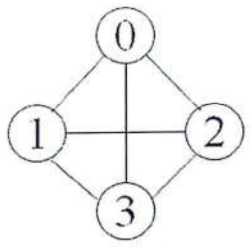
b) Given a Binary Tree (Linked Implementation).Write a function printpath to print all the paths from root to leaf node.
Input:Output :Root-to-leaf paths:

```
      5
     / \
    4   8                  path 1: 5 4 11 7
   /   / \                 path 2: 5 4 11 2
  11  13  4                path 3: 5 8 13
 / \       \               path 4: 5 8 4 1
7   2       1
```

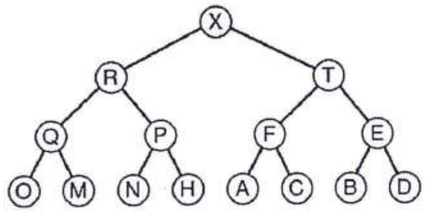
— **6**

c) Give C function to check if a directed graph(represented using adjacency matrix) has a cycle or not using DFS — **6**

d) Represent the given graph diagrammatically using Adjacency Multilist — **4**



4. a) Consider the following max-heap: — **4**



i)Draw the resultant heap after inserting S
ii)Draw the resultant heap after deleting the maximum from the original max-heap shown above (before S has been inserted).

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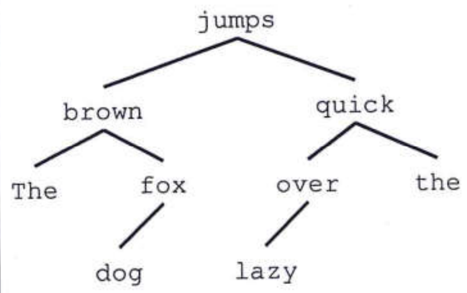
	b)	Show that the below tree is indeed an AVL tree by writing in the balance indicators for each node of the tree (hint: balance indicator =height of right subtree - height of left subtree)  jumps brown quick The fox over the dog lazy insert the word "keen" into the above tree and rebalance the tree as necessary so that it remains an AVL tree. Show all intermediate steps and draw the resulting tree	4
	c)	Write a C function to delete a node with a given key value from a Binary Search Tree(Linked Implementation). Explain all cases with a suitable example	8

	d)	Give implementation of method in C to find inorder predecessor of a node in a Threaded Binary Tree.
		Assume following structure definition of node
		
		struct Node
		{
		struct Node *left_child, *right_child;
		int info;
		int left_thread;
		int right_thread;
		};
		typedef struct Node Node;
			4

5.	a)	Given input {19, 26, 13, 48, 17} and a Hash function H(k)=k mod 7, draw the table that results after inserting the input values in the given order when collisions are handled by i) Separate Chaining ii) Linear Probing iii) Double Hashing using second hash function h'(k)=5-(k mod 5)	8
	b)	What are applications of TrieTree?	4

	c)	Write a C function to delete a word from Trie Tree.
		Structure definition for node of a Trie Tree is as follows
		struct trienode
		{
		struct trienode* child[26];
		int endofword;
		};
			8