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PES University, Bangalore

(Established under Karnataka Act No. 16 of 2013)

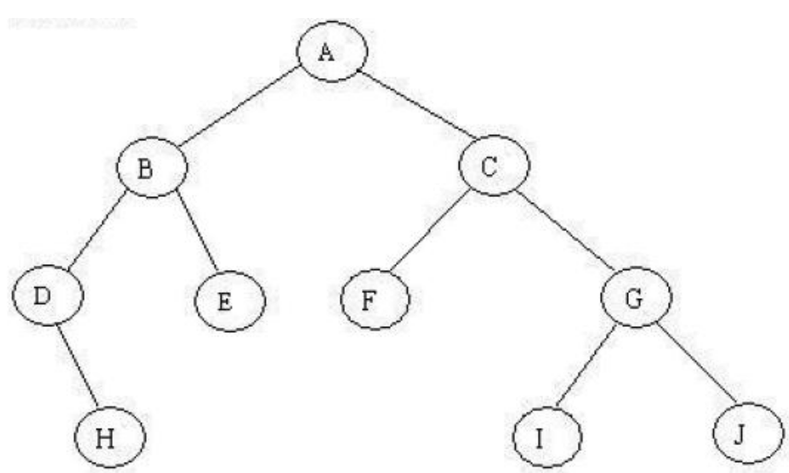
UE17CS202

Dec 2018: END SEMESTER ASSESSMENT (ESA) B.TECH. III Semester

UE17CS202- Data Structures

Time: 3 Hrs | Answer all questions preferably in the same order | Max Marks: 100

NOTE: **Detailed algorithm or C code is acceptable. Show all steps and State any assumptions made.**

1	a)	Give 2 reasons of preferring an array over a list. Similarly, give 2 reasons when list is preferred over an array?	4
	b)	Explain how polynomial arithmetic of single variable can be implemented using singly linked list. (i) Specify structure of each node of the list.(ii) Show with an example of how polynomial addition and multiplication operations can be performed using linked list.	8
	c)	Specify the DNODE structure of an integer doubly-linked list (dll). Write a function to delete a node based on the specified index position in the dll. (0 should delete the head node, 1 should delete node after the head and so on). Make sure you handle all boundary conditions.	8
2.	a)	Convert the following infix expression to its equivalent postfix and prefix expressions. Write the equivalent binary expression tree. A * (B + D) / E – F * (G + H / K)	6
	b)	Write a method that will take two sorted stacks A and B (min on top) and create one stack that is sorted (min on top). You are allowed to use only the stack operations such as pop, push, empty, size and top. Other than stacks, no other data structures such as arrays are allowed.	6
	c)	Implement enqueue and dequeue operations of a circular queue using an array of size N. Assume f is the index to the front element of the queue and r is index where the next element gets inserted into the queue. Implement any other auxiliary function that may be needed.	8
3.	a)	Write down the pre-order and post-order traversals of the following binary tree.  	4
	b)	Write a function that can find the number of connected components in a graph using depth first	8

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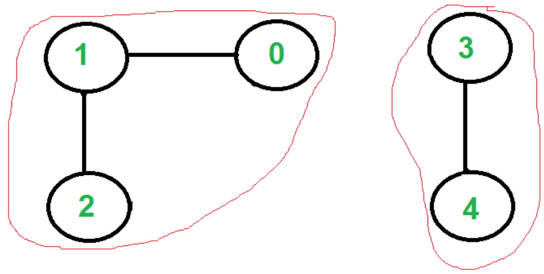
		search (DFS). Use the Adjacency Matrix representation of graph.  There are two connected components in above undirected graph 0 1 2 3 4	
	c)	Given a binary tree and a sum, return 1 if the tree has a root-to-leaf path such that adding up all the values along the path equals the given sum. Return 0 if no such path can be found. . (For example, in the binary tree in question 3(a), A+B+D+H is one such root-to-leaf path) int hasPathSum(struct tnode* node, int sum)	8
4.	a)	What data structures can be used to implement a priority queue?. Explain why a heap is preferable to other data structures to implement a priority queue?	4
	b)`	Draw a Binary Search Tree with these numbers showing the intermediate trees. 44, 17, 88, 32, 28, 65, 54, 29, 82, 76, 97 (i). Redraw after adding 80 and 35. (ii) Redraw after 44 is removed from the BST.	8
	c)	A priority queue is implemented using max heap where the maximum element is at the root of the heap. Assume the integer array *h[ ]* stores the heap elements and *count* stores the number of heap elements. Implement a function called RemoveMax() to remove the maximum element of the heap and adjust to form a heap again. int RemoveMax(int *h, int *count); // returns the maximum element of heap h and heapify	8
5.	a)	How can a trie tree be used to find the positions of word occurrences in a page of text?. Draw suitable diagrams to illustrate your solution. (eg. all positions of a word “stock” in a page of text)	6
	b)	Suggest a hash function that hashes a string of characters to an index of a hashtable of size TSIZE. Two words of same characters (top, pot) should hash to different indices.	6
	c)	Draw the 11-entry hash table that results from using the hash function h(i) = (2i+5) mod 11 to hash keys 12, 44, 13, 88, 23, 94, 11, 39, 20, 16, 5. Show the hash table when collisions are handled by using (i) Chaining (ii) Linear Probing.	8