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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S,FE) / S3 (PT) (S,FE) Examination June 2024 (2015 Scheme)

Course Code: CS205

Course Name: DATA STUCTURES

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries3 marks. Marks

1		Define Data Structure. Draw the hierarchical diagram that depicts the types of data structures.	(3)
2		Differentiate time and space complexity.	(3)
3		Define linked list. Write the representation of linked lists in memory.	(3)
4		Differentiate abstract and concrete data structures.	(3)

PART B

Answer any two full questions, each carries9 marks.

5	a)	List out the differences between recursive and iterative algorithms?	(4)
	b)	Explain in detail the estimation of Time Complexity and Space Complexity of a recursive algorithm.	(5)
6	a)	Discuss stepwise refinement technique in details with suitable block diagram.	(4)
	b)	Given a doubly linked list, write an algorithm that removes a specified node and inserts it at the beginning.	(5)
7	a)	Mention the role of header node in a linked list.	(3)
	b)	Write down the algorithm to add two polynomials using linked list	(6)

PART C

Answer all questions, each carries3 marks.

8		List out any three applications of a stack data structure.	(3)
9		Mention the disadvantage of an ordinary queue and how it is resolved in a circular queue. Illustrate with the help of an example	(3)
10		Is a full binary tree complete? Yes /No? Justify your answer with examples illustrating the same.	(3)

11 Draw the binary tree whose sequential representation is given below. (3)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A	B	C	D	-	E	F	-	G	-	-	H	-	-	I

PART D

Answer any two full questions, each carries 9 marks.

12 a) Given 6 memory partitions 300 KB, 600KB, 350KB, 200KB, 750 KB and 125KB (inorder). How would the first fit, best fit and worst fit algorithms place processes of size 115KB, 500KB, 358KB, 200KB and 375KB (in order))? Rank the algorithms in terms of how efficiently they use memory. (6)

b) Define level and height of a tree. Illustrate with the help of an example. (3)

13 a) Assume A=2, B=3, C=4. Evaluate the following postfix expression. (4)
ABC+*CBA-+*

b) Construct the binary tree whose preorder and inorder traversals give the following sequence: (5)
Preorder: ABCDEFGHI Inorder: BCAEDGHFI

14 a) Write a recursive algorithm to count the number of internal nodes in a binary tree. (4)

b) Write an algorithm / pseudocode to search a particular substring in the given input string. (5)

PART E

Answer any four full questions, each carries 10 marks.

15 a) Prove that the maximum number of edges in a graph with 'N' vertices is N*(N-1)/2. (3)

b) Create a max heap with following data 98, 67, 89, 38, 42, 54, 87, 17, 25. Show the resultant max heap after inserting a new data 97 into it. (7)

16 a) Explain non recursive DFS algorithm for graph traversals. Give an example. (5)

b) Write the algorithm / pseudocode for insertion sort. (5)

17 a) Write the recursive algorithm for Merge Sort. (5)

b) Given the following list of numbers- [21, 1, 26, 45, 29, 28, 2], show the output obtained after each pass of merge sort. Discuss the time complexity. (5)

18	a)	Write the algorithm /pseudocode for recursive binary search.	(4)
	b)	Explain about any three hash functions. Give examples for each	(6)
19	a)	Define hashing. What are the properties of a good hash function?	(3)
	b)	Given input keys {1, 3, 23, 9, 4, 29, 19} and a hash function h(x)=x % table size. The initial hash table contains 10 slots. Show the resulting table after rehashing when the load factor=0.5 using linear probing.	(7)
20		Given the values {2341, 4234, 2839, 430, 22, 397, 3920} a hash table of size 7 and a hash function h(x) = x mod 7. Show the resulting table after inserting the values in the given order with each of the following collision strategies. (i) separate chaining (ii) linear probing (iii) double hashing with second hash function h1(x) = (2x – 1) mod 7.	(10)

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