Total number of printed pages:3

UG/3rd/UCSE301

2023

DATA STRUCTURES AND ALGORITHMS

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer any five questions.

1.	a)	Write an algorithm to implement the binary search technique.	6
	b)	Apply binary search and find the location of 23 in the following list of elements. Show each step explicitly. 4, 7, 10, 14, 18, 23, 38, 57, 74, 91	6
	c)	Compare linear search and binary search.	3
	d)	Write an algorithm to insert an element into a linear array.	5
2.	a)	Suppose LIST is a linked list in memory consisting of numerical values. Write a procedure for each of the following:	5+5=10
		i) Finding the maximum of the values in LIST.	
		ii) Finding the average of the values in LIST.	
	b)	Describe a two-way linked list. How is it different from a one-way list?	2+3=5
	c)	Write an algorithm to search for a specific element in a circular linked list.	5
3.	a)	Consider the following stack, where STACK is allocated N=6 memory cells: STACK: A, D, E, F, G, _ [Note: _ denotes an empty memory cell] Describe the stack as the following operations take place:	4
		i) PUSH(STACK,K)	
		ii) POP(STACK,ITEM)	
		iii) PUSH(STACK,L)	
		iv) PUSH(STACK,S)	
	b)	Write a procedure for deleting an element from a stack represented using a linked list.	6
	c)	Convert the following infix expressions to their prefix equivalent:	2+3=5

		i)	(A – B / C) * (D / E - F)	
		ii)	(A + B ^ D) / (E - F) + G	
	d)	Evaluate the following arithmetic expression P, written in postfix notation using stack P: 12, 17, 3, -, /, 2, 1, 5, +, *, +		5
4.	a)	Consider the following infix expression Q: Q: ((A + B) * D) ^ (E - F) Use stack to translate Q to its equivalent postfix expression P.		7
	b)	Suppose a queue is maintained by a circular array QUEUE with N=12 memory cells. Draw the structure of QUEUE and find the number of elements if		3x2=6
		i)	FRONT=4, REAR=8	
		ii)	FRONT=10, REAR=3	
		iii)	FRONT=5, REAR= 6 and then two elements are deleted.	
	c)	Write a procedure to delete an element from a queue maintained by a circular array.		5
	d)	What do you mean by a priority queue?		2
5.	a)	A binary tree T has 9 nodes. The inorder and preorder traversals of T yield the following sequences of nodes: Inorder: E A C K F H D B G Preorder: F A E K C D H G B Draw the tree T.		5
	b)	Construct an AVL tree for the following data: 21, 26, 30, 9, 4, 14, 28, 18, 15, 10, 2, 3		10
	c)	Write a brief note on linked representation of a graph.		5
6.	a)	Use quick sort to arrange the following list of numbers in ascending order. 40, 29, 7, 51, 73, 86, 36, 56, 95, 18, 84, 62		8
	b)	Derive the worst case and average case time complexity of quick sort algorithm.		3+3=6
	c)	Write the merging procedure of the merge sort algorithm.		6
7.	a)	What do you mean by hashing?		3
	b)	Consider the following 4-digit employee numbers:		3x3=9

		9614, 5882, 6713 Find the 2-digit hash address of each number using		
		i)	Division method with m=97	
		ii)	Mid-square method	
		iii)	Folding method without reversing	
	c)	When does a collision occur in hashing? Discuss any 2(two) types of collision resolution techniques.		2+6=8