VIT®
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

School of Computer Science and Engineering

Fall Semester 2024-25

CAT I

SLOT: B1+TB1

Programme Name & Branch: B.Tech. - Computer Science and Engineering

Course Name & Code: Data Structures and Algorithms, BCSE202L

Class Number (s): VL202425010 – 1845, 1784, 1794, 1842, 1788, 4222, 1804, 1821, 1833, 8003, 1848, 1798, 1817, 1814, 1829, 1825

Faculty Name (s):

Exam Duration: 90 Min. **Maximum Marks: 50**

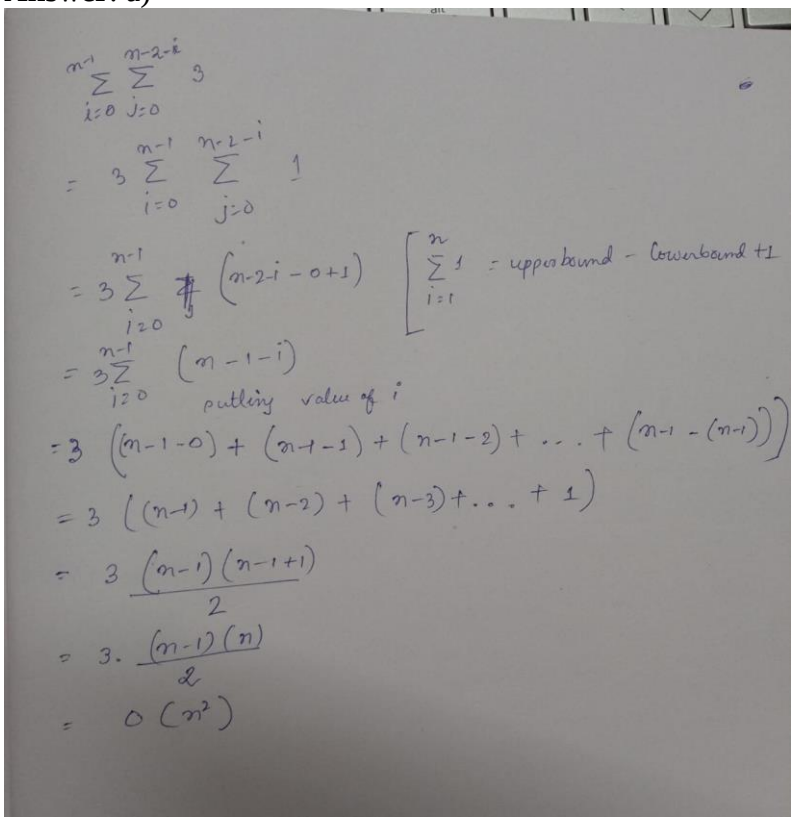
General instruction(s):

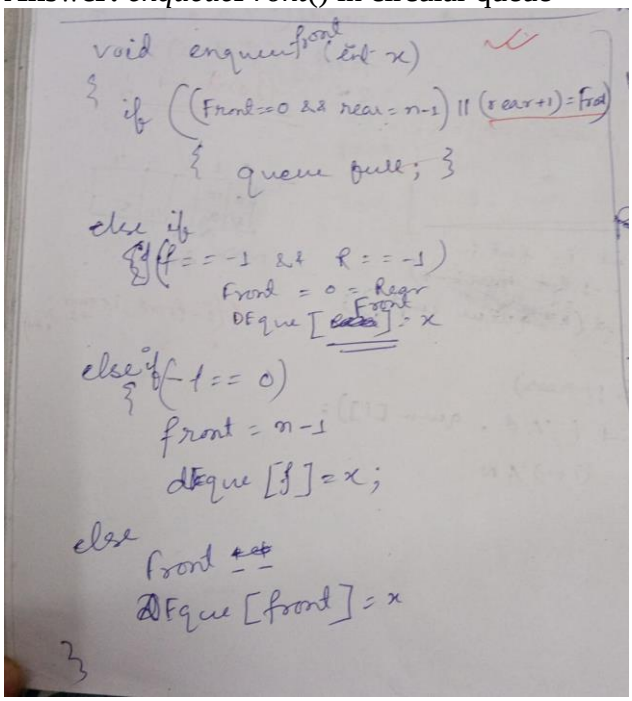
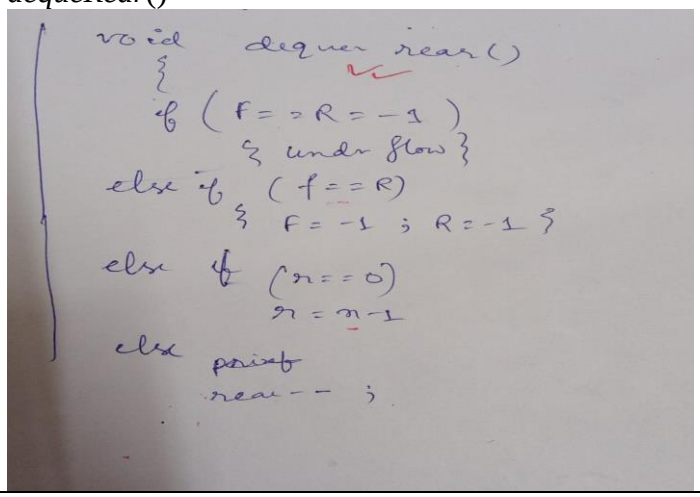
Specify if any printed material may be permitted

Any other specific instruction

Q. No.	Question	Max Marks	CO	BL

1.	a) Function Sort(array, n)
	// n is the number of elements in array
	for (i from 0 to n-1)
	{
	for (j from 0 to n-2-i)
	{
	if array[j] > array[j+1]
	{
	// Swapping array[j] and array[j+1]
	temp = array[j]
	array[j] = array[j+1]
	array[j+1] = temp
	}
	}
	}
	Find out the worst-case time complexity for this iterative algorithm using summation formulas. Assume that the input array is unsorted.
	
	b) Write the pseudo code for recursive linear search algorithm, and the find the recurrence relation of the algorithm.
		10	CO1	BL3

	Answer: a)  b) T(n) = T(n-1) + 1			
2.	State Master's Theorem and apply the same to solve the following recurrence relation : a) $T(n) = T(n/2) + 2^n$ b) $T(n) = 2T(n/2) + n \log n$ c) $T(n) = 3T(n/2) + n^2$ d) $T(n) = 64T(n/8) - n^2 \log n$ **Answer**: a) $\Theta(2^n)$ (Case 3) b) $\Theta(n \log^2 n)$ (Case 2) c) $\Theta(n^2)$ (Case 3) d) Does not apply as f(n) is not positive	5+5	CO1	BL4
3.	Provide the steps for a) infix to postfix and b) infix to prefix conversion using proper data structure and show to convert the given infix expression: (a–b)/c*(d + e – f / g) to postfix. **Answer**: **Postfix** : ab – c /d e + f g / - * **Prefix**: * /- a b c - + d e /f g	(5+5)	CO2	BL3
4.	Deque (Double Ended queue) efficiently manages insertion and deletion of elements at both ends, i.e., front and rear. Implement and compare *enqueueFront*() *dequeRear*() operations for linear and circular DEqueue.	(5+5)	CO2	BL4

	Answer: *enqueueFront*() in circular queue  *dequeRear*() 			
5.	Output of a sorting algorithm after 2nd iteration looks like: 10 12 93 42 77 63 57. • Identify the sorting algorithm applied on this array of integers; (1 mark) • show the steps to sort the entire array, (4 marks) • provide the pseudo code for the same algorithm. (5 marks) **Answer**: Selection sort is the most appropriate choice	10	CO3	BL3