BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2024)

CLASS: B.TECH. **SEMESTER : IV**
BRANCH: BT/CHEMICAL/ECE/EEE/MECH/PIE **SESSION : SP/2024**

SUBJECT: CS261 FUNDAMENTALS OF DATA STRUCTURES

TIME: 02 HOURS **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Discuss the difference between Linear and Non-Linear Data Structures with example.	[2]	2	1
Q.1(b)	What do you understand by Big-O notation, Theta notation and Omega notation? Explain with suitable diagram.	[3]	2	1

Q.2(a)	Consider the following algorithm
	Algorithm Test(int n)
	{
	value=0;
	for (i =n; i>0;i/=2)
	for j in range(0 to i)
	value=value+1
	return value
	}
	Write down the stepwise demonstration for the time complexity of the above algorithm.
		[2]	1	4

Q.2(b)	Let A and B be two n x n matrices of integers. A "Diagonal-intersection-Set (DIS)" between two n x n matrices is defined as follows: DIS = the set of all elements 'x' in A and B such that 'x' belongs to the principal diagonals of both A and B or 'x' belongs to the anti-diagonals of A and B. DIS will not contain an element 'y' if y belongs to the principal diagonal of A and anti-diagonal of B (and vice-versa). For e.g. $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$ and $B = \begin{bmatrix} 7 & 1 & 3 \\ 4 & 6 & 5 \\ 1 & 7 & 9 \end{bmatrix}$ then $DIS(A,B) = \{3,9\}$ Note that 7 does not belong to DIS. Write an algorithm to find the DIS of two n x n matrices A and B.	[3]	1	3
Q.3(a)	Let A be a one-dimensional array of n distinct numbers. A pair (A[i], A[j]) is said to be an index-value inversion if these numbers are such that A[i]=j and A[j]=i. Write an algorithm for counting the number of index-value inversions and compute the running time of your algorithm.	[2]	3	2
Q.3(b)	Consider two arrays, A[] and B[] which stores x and y number of integers, respectively, write the pseudocode/algorithm to compute the DifferenceSet(A[];B[]) which gives a third array C[] which hold integers in A[] which are not in B[]. For example, if A[] = [71; 41; 91; 12; 21] and B = [51; 12; 31; 71], then C should be [41; 91; 21]. Mention the worst-case time complexity of the code that you have written.	[3]	2	2

PTO

Q.4(a)	Which data structure is taken into consideration for the function calls and explain various operation on the selected data structure.	[2]	3	2
Q.4(b)	Convert the following: (a) Postfix expression into prefix expression AB/CD^+FG*+ (b) Prefix expression into postfix expression +-+*XYZ/^STA^BC	[3]	4	5
Q.5(a)	Consider the campus of BIT. Students are lined up to get their ID checked at the library scanner. Which data structure is most suitable for the task? Justify your answer. Write the algorithm for the task(s) performed by the data structure.	[2]	5	4
Q.5(b)	Consider the following queue as follows where front=1 and rear=5	[3]	4	6

	A	B	C	D	E				

Perform the following operation on the queue

a. Insert F
b. Perform deletion operation twice
c. Insert G and H respectively
d. Perform deletion for four consecutive alphabets
e. Insert I

Demonstrate each step with suitable diagram to display front and rear location after each operation

:::::27/02/2024 M:::::