Programme	:	B.Tech(CSE-BDS,BCE)	Semester	:	FALL 2024-2025
Course Code & Course Title	:	BCSE202L - Data Structures and Algorithms	Class Number	:	CH2024250100605
Faculty	:	Dr.J.Uma Maheswari	Slot	:	A2+TA2
Duration	:	1 Hour 30 Mins	Max. Mark		50

General Instructions:
- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks

1.		(i) Find the time complexity of the following recurrence equations [6 marks]
		
		 a. $T(n) = 4T(n/2) + n$
		 b. $T(n) = 7T(n/3) + n^2$ [Note: $\log_3 7 = 1.771$]
		
		 (ii) Find the time complexity of the following recursive function using iteration method [4 marks]
		
		 `long power(long x, long n)`
		 `{`
		 `    if (n == 0) return 1;`
		 `    else return x * power(x, n-1);`
		 `}`
			10

2.		Given a sorted array arr[] of N positive integers, Design an efficient algorithm to find the ceiling of a number x in a given array. Calculate the time complexity of your algorithm. Note: Ceiling of an element x is the smallest element present in an array greater than or equal to x. The ceiling is not present if x is greater than the maximum element present in the array, In that case display "Ceiling is not present" in the output. For example, input arr[] = {12,67,90,100,300,399} x=95 output 100	10
3.		The party decoration vendor got an order for birthday party. His Job is to arrange "n" chairs with four different colours. The chairs are of colours red, green, yellow and blue. Initially chairs are arranged in a random manner(mixed arrangement of all coloured chairs). Your task is to help the party decoration vendor by writing an efficient algorithm	10

which gives minimal time complexity to arrange the chairs in a line such that all the red chairs go first, then green ,yellow and blue. Make sure that the time complexity of your algorithm should be minimal.

Input:
15 (number of chairs)
R R Y G B Y B G Y R B G B Y G (arrangement of Chairs)
Sample output
R R R G G G G Y Y Y Y B B B B

4.

Suppose you are a software developer working on a compiler project. As part of your task, you need to evaluate the given arithmetic expression.

$$X * (Y + Z) / A - B * (C + D / E)$$

(i)   Convert the given infix expression to postfix notation using suitable data structure and show each step with illustration.
                                                                [6 Marks]

(ii)   Evaluate the postfix notation with the following values and illustrate the same.   [4 Marks]
        X=2, Y=3, Z =15, A = 6 , B= 7, C = 6, D = 2,E=2

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5.

There are two stacks of non-negative integers, stack1 and stack2 .
Mr X challenges Mr.Y to play the following game:
- In each move, Mr.Y can remove one integer from the top of stack1 and stack2 .
- Mr.Y finds a sum of the integers he removes from two stacks.
- Mr.Y is disqualified from the game if, at any point, his calculated sum becomes greater than some integer(max sum) given at the beginning of the game.
- Mr.Y final score is the total number of integers he has removed from the two stacks.

Write an algorithm to calculate the final score of Mr.Y after playing the game and analyse its time complexity?
Input
    5 (number of elements of stack1 and stack2)
    1 2 3 4 5(Elements of stack1 (top is pointing to value 1))
    11 22 33 44 55(Elements of stack2 (top is pointing to 11))
    30(max sum)
output
6 (Elements removed from two stacks 1,11,2,22,3,33)
Procedure
Round 1
1+11=12 which is lesser than 30
Round 2
2+22 = 24 which is lesser than 30
Round 3
3+33 = 36 which is greater than 30 . So Mr.Y is disqualified and his score is 6.

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**********All the best ************