NATIONAL INSTITUTE OF TECHNOLOGY WARANGAL

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

I B.Tech., I Semester, END Examination, March 2021

CS101: Problem Solving and Computer Programming

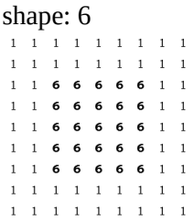
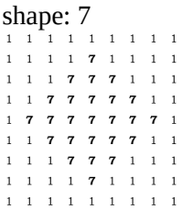
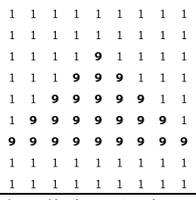
Date: 24-03-2021 ***Time: 2 Hrs. 30 Mins + 20 Mins*** Max. Marks: 40

→ ***We have a total of EIGHT question.***

→ ***The answer needs to be written on a paper with pen.***

→ ***Answer all questions. Each Question carries 5 Marks***

1	1_A	A magic number is defined as a number which can be expressed as a power of 5 or sum of unique powers of 5. First few magic numbers are 5, 25, 30(5 + 25), 125, 130(125 + 5). Write a function to find the n^{th} Magic number. **OR**
	1_B	The number of events that the company organizes every month is recorded sensibly and is seemed to have followed a specific series like: 30, 35, 38, 41, 54, 53 ... Write a program which takes an integer N as the input and will output the series till the Nth term. **For example if N is** 10 then output to be 30 35 38 41 54 53 78 71 110 95 **OR**
	1_C	The price of a stock is sometimes, taken to the ***nearest fourth of a rupee***; for example, the value $29\frac{2}{3}$ is to be taken as $29\frac{3}{4}$ and $29\frac{5}{9}$ is to be taken as $29\frac{1}{2}$. Write a program that computes the value of total holding of the shares. The program asks for the number of shares of stock owned, the whole rupee portion of the unit price and the fractional portion as two integers - numerator and denominator. The program then outputs the value of the user's holdings. Your program should include a function ***double val (int, int, int)*** that takes the three arguments – Rupee portion, numerator and denominator of fractional portion of the share value and returns the unit price of the share.
2	2_A	For every positive number 'n' we define a function streak(n)=k as the smallest positive integer k such that n+k is not divisible by k+1. **For example:** 13 is divisible by 1 , 14 is divisible by 2, 15 is divisible by 3, 16 is divisible by 4 17 is NOT divisible by 5 So streak(13)=4. Similarly: 120 is divisible by 1, 121 is NOT divisible by 2 So streak(120)=1. Now, define **P(k, N)** which will give the number of integers **n**, **1<n<=N**, for which **streak(n) = k**. Write a program to get the input as 'k' and 'N' and, find the count of integers until N which has the streak value as 'k'. **Sample Input 1:** 3 14 **Sample Output 1:** 1 **Explanation:** If s=3 and N=14. If we start computing streak value for the integers from 1 to N, For 1, 1 is divisible by 1, 2 is divisible by 2, 3 is divisible by 3, 4 is divisible by 4 so the streak value of 1 is more than 3. For 2, 2 is divisible by 1, 3 is NOT divisible by 2 so the streak of 2 is 1. likewise, we can see only the integer 7 has the streak value of 3 within 14, Because 7 is divisible by 1, 8 is divisible by 2, 9 is divisible by 3, 10 is NOT divisible by 4 Hence streak(7) = 3. So P(3, 14) = 1 and so the output is 1. **OR**

<table>
<tr><td></td><td>2_B</td><td>We need to create a shape at the center of this array with the user-entered shape, size of shape and the number to be used in this shape. The different shapes are square, diamond and triangle. The size for square is of length m, where m the distance from center. The diamond is of length m, where m is the distance from center. The triangle is of size b×h, where b=4*m+1 and h=2*m+1, m=1, 2, 3….
Example:
Enter the size of the array : 9
Enter the shape you want :square
Enter the value of m : 2
Enter the number to fill the shape: 6
 
Enter the size of the array: 9
Enter the shape you want :diamond
Enter the value of m : 3
Enter the number to fill the shape: 7
 
Enter the size of the array : 9
Enter the shape you want :triangle
Enter the value of m : 2
Enter the number to fill the shape: 9
  </td></tr>
<tr><td>3</td><td>3_A</td><td>Write a C++ program to display the leap years that contain the digit ‘x’ given by the user, between two given year n1 and n2 both inclusive. For example, if n1 and n2 are 1990 and 2020 and if the digit ‘x’ is 6, the outputs need to be: The number of leap years between 1990 and 2020 that contains the digit 6 are: 1996, 2016.
OR</td></tr>
<tr><td></td><td>3_B</td><td>Write a program to copy the elements of an array into another by replacing every element with largest element to its right plus smallest element to its left. In case of first element, take the smallest to its left as zero and in case of last element, take largest element to its right as zero. For example, if the given array is: 1 5 8 9 6 3 5 7 2 2, the modified array should be 9 10 10 8 8 8 8 3 3 1.</td></tr>
<tr><td></td><td>3_C</td><td>OR
Assume that you are given with a list of words, given in ascending order based on their length. Write a program, using Binary Search, to find a specified length word, if it exists, in the given list of words. If a word of the given length does not exist, display appropriate message.
Ex: The list of names are: an cat NITW Warangal Hyderabad procrastination
Enter the length of the word you want to find: 8
OUTPUT: It is found at position: 4 and it is: Warangal</td></tr>
<tr><td>4</td><td>4_A</td><td>Write a program to display a magic square for an odd order. Sum of rows, columns and diagonal are same for a magic square.

Enter the a positive odd number : 7
Magic square of 7*7

28 19 10 1 48 39 30
29 27 18 9 7 47 38
37 35 26 17 8 6 46
45 36 34 25 16 14 5
4 44 42 33 24 15 13
12 3 43 41 32 23 21
20 11 2 49 40 31 22

Sum of elements in each row or column or diagonal – 175

OR</td></tr>
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	4_B	Given two integers **N** and **M**, where N is the number of friends sitting in a clockwise manner in a circle and M is the number of cakes. Write a program to calculate the left number of cakes after distributing **i** cakes to **ith** friend. The distribution of cakes will stop if the count of cakes is less than the required amount. **Input:** N = 4, M = 11 **Output:** 0 1st round: The 1st friend gets 1 cake, 2nd gets 2 cakes, 3rd get 3 and 4th gets 4 cakes. Remaining cakes = 11 – (1 + 2 + 3 + 4) = 1 2nd round: This time only 1st friend gets the left 1 cake. Remaining cakes = 1 – 1 = 0 **Input:** N = 3, M = 8 **Output:** 1 1st round: The 1st friend gets 1 cake, 2nd gets 2 cakes, and 3rd get 3 cakes. Remaining cakes = 8 – (1 + 2 + 3) = 2 2nd round: This time only 1st friend gets the left 1 cake, and then there is no cake left for 2nd friend. Remaining cakes = 2 – 1 = 1
5	5_A	Assume that we have an array of elements (non-negative numbers). Now, write a program to find the index of the smallest number in the array so that removal of the element will make the sum of remaining numbers in the array will be divisible by the given number (N) specified by the user (means, user defined number). If No such element present in the array which removal will not make sum of the array element divisible by N, then print "-1". Note: Using of Any STL library functions will not be acceptable. For better understanding of the above program, please go through the following sample examples. Example input 01: Array elements: {24,8,17,4,12} N=8 Output: 2 Explanation : if you remove 17 from the array and sum remaining elements 24+8+4+12 = 48 so, 48 is divisible by 8 so, index of 17 is 2 output is 2. **OR**
	5_B	Consider that we having a 2D array (matrix) of equal number of rows and columns. Now traverse the possible paths from top left element of the 2D array, i.e., array[0][0] to bottom right element, i.e, array[lastrwo][lastcolumn], traversing means whatever the cell you are visiting of the 2D array, the value of the corresponding cells are added to determine the traversing cost. Now, there can be multiple paths available. However identify those paths which are having the same cost and print the cost and no.of paths with that cost. Note that you may get multiple paths with some cost say s1, and other multiple paths with some cost s2, and so on. You need to print all such costs. If all of the traverses are having the unique traverse costs then print -1 on to the screen. Note: your program should work for all possible test cases. The size of the matrix can be from 3*3 to 8*8. Refer the following example for better understanding of the question: Assume, the 2D array: 1 2 3 1 1 2 2 5 4 Paths with same cost as follows. Cost 13 : 1+2+1+5+4 path a[0][0] -> a[0][1] -> a[1][1] -> a[2][1]-> a[2][2] 1+1+2+5+4 path a[0][0] ->a[0][1] -> a[2][0]-> a[2][1] -> a[2][2] Cost 12: 1+2+3+2+4 path : a[0][0]-> a[0][1] -> a[0][2] -> a[1][2] -> a[2][2] 1+1+1+5+4 path : a[0][0] -> a[1][0] -> a[1][1] -> a[2][1]-> a[2][2] Now, output should be like: Cost No.of paths 13 2 12 2

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<tr><td rowspan="2">6</td><td>6_A</td><td>Write a program that returns a legal string. Rules for a legal string is:
i. |no. of vowels| in a string =prime and length of the string should be greater than 2*|no. of vowels in a string|.
ii. Now, swap the adjacent characters of the vowels present in the string. If the vowel present at the beginning or end of the string then swap the adjacent with the beginning or end(vice versa)
Example:
Rachana: ‘a’ is 3 times
Length of the string=7
Swap:
rachana=>carhana
carhana=>carnaha
carnaha=>harnaca

OR</td></tr>
<tr><td>6_B</td><td>You are given with n number of names. Write a C++ program to sort the given names based on their length? Example:
INPUT: Enter the names: OUTPUT:
Sridhar Kumar A Mahesh B
Mahesh B Sri Ramana U
Siva Sai Ram U Siva Sai Ram U
Sri Ramana U Sridhar Kumar A</td></tr>
<tr><td>7</td><td>7_A</td><td>Write a program to create a structure with structure tag as ‘NITStaff’ with the member variables as StaffId, Name, Salary, Department and NameofNIT. Read sixty staff details into respective structure variables. Then your program should display the details of the staff member whose salary is more than Rs.90,000 of NITW with name ‘Sridhar’
OR</td></tr>
<tr><td></td><td>7_B</td><td>Consider a structure with the members: Roll_No, Section, Marks_in_PSCP. Write a program to read the details of seven sections (A, B, C, D, E , F and P) students where each section contains 70 students. Calculate the average marks for each section and also the average of all the seven sections. You need to write the program by using structures.</td></tr>
<tr><td rowspan="2">8</td><td>8_A</td><td>Write a program to read the names stored in three different files: file1.txt, file2.txt and file3.txt and sort all the names from all these files and store the sorted names in file4.txt
file1.txt file2.txt file3.txt file4.txt
Sridhar Sri Ramana Sunil-CR Mahesh
Mahesh Siva Sai Ram Raja Raja
Siva Sai Ram
Sri Ramana
Sridhar
Sunil-CR

OR</td></tr>
<tr><td>8_B</td><td>Take a file “input.txt” containing some text. Given a string STR, find and display how many words are present in “input.txt” for which the given string STR is a substring. Write a C++ program to create and display the file “output.txt” which contains only such words that are palindrome. If such words do not exist, display “palindrome words do not exist.”
Input:
STR=”al”
Content of input.txt:
although numerous languages are spoken across india, malayalam is considered as one of the difficult languages to learn. Still, it is not as difficult as arabi to speak and learn. The mandarin chinese is the most difficult language to learn in the world, especially for english speakers. Interestingly, it is also the most widely spoken language in the world.

Output:
“al” found in although, malayalam, especially.
Content of output.txt:
malayalam</td></tr>
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