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National Institute of Technology Kurukshetra, AY2023-2024 Semester 1

Problems Solving and Programming Skills (CSIC 103)

Common For ECE, EE, IIOT, M&C, ME, PIE and REAPPEAR students

Mid-Semester Exam – 2, NOVEMBER 2023 (Closed Book)

Max Marks: 20

Duration: 50 Minutes

INSTRUCTIONS: FOR PROBLEM-SOLVING PROBLEMS (Q1 to 4), BEFORE WRITING THE SOURCE CODE, THE ALGORITHM/LOGIC MUST BE EXPLAINED IN DETAIL.

1. [4M] Write a program that takes an $M \times N$ matrix as input from the user and finds its transpose. The transpose of a matrix is obtained by exchanging the elements of each row with the elements of the corresponding column.
2. [4M] Write a program that counts the number of digits of a positive number using recursion.
3. [5M] Write a function "PeakElement" to find a peak element which is not smaller than its neighbours. The function "PeakElement" must take array and number of elements in an array as arguments and return the index of Index of a peak element.

Eg: Input: Arr = { 1, 3, 20, 4, 1, 0 }

Output: Index of a peak element is: 2

4. [5M] Write a program that takes an array of positive integers A_1, A_2, \dots, A_N with length N as input from the user and prints an array of the same length (N) where the values in the new array are the sum of every number in the array, except the number at that index.

For example, suppose the input array is 1 2 3 4. In that case, the output array is 9 8 7 6 (For the first index, the result will be $2+3+4=9$, similarly for the second, third and fourth index the corresponding results will be 8, 7 and 6 respectively.)

5. [2M] A C program contains the following statements.

```
int i, j = 25;
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int *pi, *pj = &j;
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pi = pj;
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If the value assigned to i begins at address F9C and the value assigned to j begins at address F9E, then

- (a) What value is represented by $\&i$?
- (b) What value is assigned to pj ?
- (c) What value is assigned to $*pj$?
- (d) What value is represented by $*pi$?