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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 and PIE**
Mid-Semester Exam – I, September 2023 (Closed Book)

Max Marks: 20 **Duration: 50 Minutes**

INSTRUCTIONS: ALL questions are COMPULSORY. The paper has a total of SIX questions on ONE printed page.

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

1. **[4 Marks]** A viral disease in a particular city (with population *N*) is started with some initial patients (say *I*). The disease is non-fatal and non-curable. If a person is infected with it, he/she will remain infected and will continue to spread the virus.
Write a C program to determine the number of days by which the whole population will be infected. Assume that, on Day 0, there are *I* number of infected persons. The inputs to the program are the number of initially infected persons (i.e. *I*), the rate of infection per day by a single person (*r*) and the total population of the city (*N*).
Sample Test Cases:
Input: *I*=5, *r*=3, *N*=80 Output: Days=2
Input: *I*=5, *r*=3, *N*=82 Output: Days=3

2. **[4 Marks]** Write a C program to print the following pattern given the number of rows as an input from the user.

Input- row =5

Output-

3. **[3 Marks]** In a company, an employee is paid as follows: If his basic salary is less than Rs. 50000, then HRA = 10% of base salary and DA = 90% of basic salary. If his salary is either equal to or above Rs. 50000, then HRA = Rs. 5000 and DA = 98% of basic salary. If the Employee's salary is input, write a program to find his gross salary (Hint: Gross Salary = Basic Salary + HRA + DA)
Sample Test Cases:
Input: 5000 Output: 10000
Input: 50000 Output: 104500
Input: 60000 Output: 123800

4. **[3 Marks]** Given an integer *N*, write a program to find the sum of the first and last digits of this number.

Sample Test Cases:
Input: 524 Output: 9
Input: 2345 Output: 7

5. **[4 Marks]** Determine the output of the following code snippets. Justify your answer.

5(a)

```
main() {
  float u=3.5;
  int v, w, x, y;
  v=(int) (u+0.5);
  w=(int) u+ 0.5;
  x= (int) ((int)u+0.5);
  y= (u+(int) 0.5);
  printf("%d %d %d %d", v, w, x, y);
}
```

5(b)

```
main() {
  int i=0, j=1, k=2, l;
  l= ++i && --j || ++k;
  printf("%d %d %d %d", i, j, k, l);
}
```

5(c)

```
main( ) {
  int i, j = 2;
  i = (j>5?(j<=10?100:200):500);
  printf ( "%d\n", j) ;
}
```

5(d)

```
main() {
  int i=0;
  for(i=0; i<20;i++) {
    switch (i) {
      case 0: i+=5;
      case 1: i+=2;
      case 2: i+=5;
      default: i+=4;
      break;
    } printf("%d,", i);
}}
```

6. **[2 Marks]** Write an algorithm/procedure/logic to find the Second Highest out of Three numbers.