Lab Assignment – 2 (2022)
PH-566

___

Questions to PART A should purely be answered on the paper while PART B needs writing program on the computer.

___

PART – A

For the computer programs shown below, write the outputs.

1.

```
DO K=1,2
  SUM=0.0
  DO J=K,2
   SUM=SUM+K+J
   PRINT*, SUM
  ENDDO
 ENDDO
 END
```

2.

```
      I=1
      N=4
10  IF(I.GE.1.AND.I.LT.N)THEN
     I=I+2
     GOTO 10
     SUM = SUM+ (–2)**I/I
    ENDIF
    WRITE(*,*) I, N, SUM
    END
```

3.

```
   INTEGER  I,I0
   REAL  X,SUM
   X=2.0
    DO I=1,4,2
     I0=I/2
     SUM=SUM+(–1)**I0*X**I/I
     PRINT*, I, I0, SUM
    ENDDO
   IF(I.EQ.4)PRINT*, I, SUM
   END
```

PART – B

1. The following are the Final Numbers obtained in various courses by different students in a class.

Roll No.	Number 1	Number 2	Number 3	Number 4	Number 5
1	88.5	80.0	72.3	88.5	82.8
2	76.2	61.7	72.4	89.1	47.2
3	32.0	43.4	50.4	70.5	35.4
4	90.5	87.0	70.7	100.0	77.3
5	100.0	90.3	75.6	97.3	87.6
6	55.9	57.8	43.0	75.2	55.2
7	60.7	67.4	46.3	70.3	64.3
8	40.0	50.7	41.2	60.0	48.0
9	36.5	40.0	23.9	60.1	53.5
10	56.7	65.0	45.4	66.7	57.2

(i) Read the Roll Numbers and the Final Numbers from an Input File (data_in.txt)
(ii) Add them to obtain the Total number for each student. If the full mark in each exam is 100, calculate the Percentage of Marks obtained by each student.
(iii) Print the Roll Number, Total Number and Percentage of Mark of each student to an Output File (data_out.txt)

[Hint: Use OPEN statements to open input and output files.
You can define 2 arrays IROLL(10) for Roll Numbers (integer) and FTN(10,7) (real numbers) for the Final and Total Numbers as well as Percentages. Use a DO-loop (for I=1,10) to add the Final Numbers for each student and print them to an output file.]

2. A power series representation of sin(x) is given by

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} \dots\dots\dots$$

Write a fortran program to evaluate $\sin(x)$ up to 4 significant digits for the values of $x=45^0$, 60^0 and 90^0. Print your result in the following format FORMAT(F7.2, F10.4, I4, F10.4, F5.2)

x	$\sin(x)$ from series	No. of terms used	$\sin(x)$ from library	%Error

3. Using the concept of 2-dimensional arrays:
   (i) Read the following matrices (A and B) from an Input File (input.txt)
   (ii) Multiply A and B, without using the MATMUL intrinsic function
   (iii) Multiply A and B using the MATMUL intrinsic function.
   (iv) Compare the above two results and check if they agree
   (v) Write the product matrix C = AxB to an Output File (out.txt)

$$A = \begin{pmatrix} 1 & 2.5 & 3.2 \\ 3.1 & -2.4 & 1.9 \end{pmatrix} \qquad B = \begin{pmatrix} 3.0 & 2.1 \\ 0.0 & -1.2 \\ 1.2 & 0.9 \end{pmatrix}$$