LAB VI

1. Create a data file **vecu.dat** with data for vector **u**

```
5
3.0  -4.0  7.0  8.0  9.0
```

and a data file **vecv.dat** with data for vector **v**.

```
5
4.0  -5.0  7.0  12.0  9.0
```

In each data file, the first line contains the dimension of the vector and the next line contains the components of the vector. Write a C program that does the following: It reads the dimensions and components of the vectors and then prints the vectors in the terminal. It then calculates the length of the vectors and the angle between the vectors (if the dimensions of the vectors are same). Finally, it writes the length of the vectors and the angle between the vectors (if exists) in a file **outv.dat**.
Expected output:

```
The vector u is: 3.00   -4.00   7.00   8.00   9.00
The vector v is: 4.00   -5.00   7.00   12.00   9.00
```

Content of outv.dat

```
Lenghth of u = 14.799
Lenghth of v = 17.748
Angle between u & v is = 10.797 degree
```

2. Write a C program that generates 100 random numbers between -0.5 and 0.5 and writes them in a file **ran.dat**. The first line of **ran.dat** contains the number of data and the next 100 lines contain the 100 random numbers.
Expected output: Depends on the program

3. Write a C program that reads the data from the file **ran.dat** (created above) and computes the average of the data. It also finds the number of data above the average value.
Expected output: Depends on the program

4. Monte Carlo simulations are used to find the probability of different outcomes in a process. Write a C program (using Monte Carlo technique) that finds the probability of 5 heads if a coin is tossed 10 times. Also, do the same for 4 heads or five heads if a coin is tossed 10 times. [To find the probability of 5 heads, we carry n number trials and a coin is tossed 10 time in each trial. Let m be the number of trials in which 5 heads appear. Then the required probability is m/n]. The probability of 5 heads out of 10 toss is $\binom{10}{5}\frac{1}{2^{10}} = 0.24609375$ and the probability of the later event is $\binom{10}{5}\frac{1}{2^{10}} + \binom{10}{4}\frac{1}{2^{10}} = 0.451171875$. The output depends on the no. of trial and the random number generator. Here is one typical input and output.

Test data and expected output:

```
Enter the number of trial: 2000
Probability of five heads is = 0.2430
Probability of five heads or four is = 0.4525
```