

# CPE 325: Embedded Systems Laboratory

## Laboratory Assignment #2

### Assignment

[50 pts]

1. Write a C program that will print the sizes and ranges of common data types char, short int, int, long int, long long int, unsigned char, unsigned short int, unsigned int, unsigned long int, unsigned long long int, float, and double. Your program's output should be like the following:

Data Type	Size (in bytes)	Minimum	Maximum
char	1	0	255
short int	2	-32768	32767
(additional data types goes here)			

**Note:** You should use definitions given in the limits.h and float.h header files for the ranges of data types. For float and double, display positive minimum value in *Minimum* column.

2. On a paper, using a pen, compute the maximum and minimum values of a data-type whose size is 2 bytes. Perform this computation considering the data-type to be (a) Unsigned data-type (b) Signed data-type. Take a picture of your solution and paste it in your report document. Alternately, you can solve in word document which can be added to the submission report.

In the list of data type that you printed in Q1, which data type is 2-bytes. Does your maximum and minimum values match with your output in Q1?

3. Write a C program that declares and initializes two integer arrays x and y. They should have at least 5 elements. You are required to compute a dot product of these two arrays. For example, one sample run output can look as following:

```
Input Array X: [-1 2 5 3 -5 6]
Input Array Y: [-7 8 23 13 23 28]
Dot Product is: 230
```

4. **(Bonus: Up to 5 pts)** Write a C program that performs the matrix multiplication on two 8x8 matrices. Display your input matrices and final result matrix.

### Questions To Be Addressed

Please make sure that you have addressed following questions in your demonstration:

1. How are format specifiers used in your Q1 program?
2. What is dot product? How do you implement dot-product in Q3?
3. Show console output for both the questions Q1 and Q3.

## **Topics for Theory:**

1. Different data types.
2. Size limit of data types.
3. Endianess

## **Deliverables**

1. Lab report which includes:
  - a. Flowchart for part 3 only
  - b. Output screenshots (& inputs)
2. Source files (.c or .cpp files) or as directed

## **Note:**

1. During demonstration, you are expected to know the size of basic data types and should be able to calculate the range of the data type for a given size.
2. Use this link to learn how to print different data types in C  
<http://personal.ee.surrey.ac.uk/Personal/R.Bowden/C/printf.html>