**CEN 203 – CEN 213 Data Structures Midterm Exam**

**28.11.2020**

**QUESTIONS**

1. **(35 points)** Compute the running time equation T(n) for the below program fragment and give a Big-O analysis of the running time.

```
for (i = 0; i < n; i++){
   for (j = 0; j < i; j++){
      if (j % 2 == 0)
         even++;
   }
}
```

2. **(30 points)** Sort the array **A=[25, 10, 6, 12, 8, 33, 42, 15]** by using the **quicksort** algorithm that you have learned in the class. Show all the steps of the quicksort algorithm.

3. **(35 points)** Write the following hash function **int h(char *key, int TableSize)** in C language. Your hash function takes a **string key** value, then gets $2^{nd}$, $5^{th}$, $8^{th}$, and $11^{th}$ characters in the key, and converts these 4 characters into a 4 digit integer. After that, your function should take the square of this number, apply mod operator with respect to TableSize, and return the result as the hash value. You should assume that key is a string with 11 characters. As an example, if key is equal to the following sting value 1**2**345**5**67**8**90**1**, then your function should compute $(2581)^2$ `mod TableSize` and then return the result. **What is the running time of your hash function in big-O notation?** Explain.