INTRODUCTION TO SCIENTIFIC AND ENGINEERING COMPUTING

FINAL EXAM

Q.1) (15) Write a main function which randomly draws 6 numbers for Lotto 6/49 game and print the numbers to the screen in ascending order.

Q.2) (15) A string is called *palindrome* which can be spelled the same in both direction (e.g. level, deed). Write a function

```
bool IsPalindrome(char *candidateString) ;
```

which tests whether the given string is a palindrome or not. If the string is a palindrome the function returns true, otherwise returns false.

Q.3) (35) Student information is represented by the following data structure called Linked List:

```
Struct SStudent {
     char     name  ;
     int      grade ;
     SStudent *next  ;
};
typedef struct SStudent  TStudent ;
typedef struct SStudent* PStudent ;
```

a) **(25)** Assume that the linked list is already created and the pointer variable **head** points to the first element of the list. Write a function

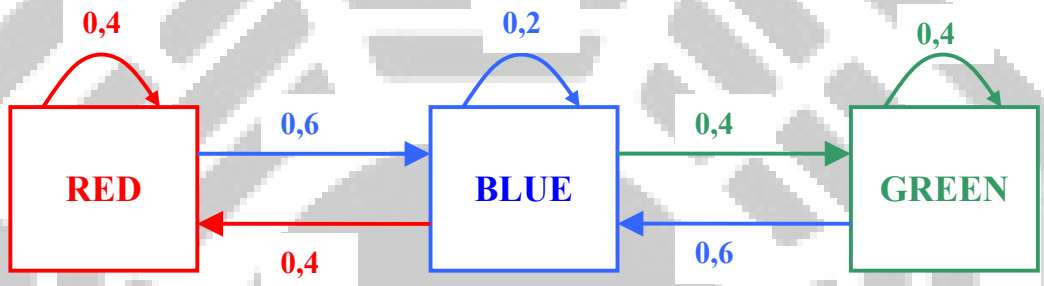
```
void Query(PStudent head,int low,int high) ;
```

which searches all elements in the list and prints the student name whose grade is between low and high.

b) **(10)** Using the Query function, write the main function in which the name of the students whose grades are between 0-10,11-20,...,91-100 are listed in the given order.

Q.4) (35) Suppose that there are three boxes colored in red, blue, and green, each containing initially **20** balls. At each time instant, a ball moves either to the **previous** box or to the **next** box, or stays at the **same** box with the probabilities given in the figure. For example, a ball in **BLUE** Box stays at the **BLUE** Box if **r≤0,2**, moves to **RED** Box if **0,2<r≤0,6** and moves to the **GREEN** Box if **0,6<r≤1** where **r**=rand()/RAND_MAX.

Write a main function in which you simulate this simple system for 100 time instants and write the number of balls in each box to the file "simulation.txt" at each time instant.



After the termination of your program, the file "simulation.txt" should look like:

Time	RED	BLUE	GREEN
0	20	20	20
1	14	31	15
2	8	30	22
3	8	30	22
4	16	22	22
5	14	27	19
6	17	28	15
7	22	23	15
8	12	32	16
9	18	22	20
10	16	30	14
11	18	24	18
12	13	32	15
13	19	22	19
14	19	17	24