C Assignment 2

Name:
Student ID:

Programming Questions

1. (10 marks) Write three functions `sum1`, `sum2`, `sum3` to sum up the integers between `from` and `to` (including `from` and `to`), using recursion, iteration and algorithm, respectively. Note that you may assume `to >= from >=0`.

```
#include <time.h>
#include <stdio.h>

unsigned int sum1(unsigned int from, unsigned int to); /* recursion */
unsigned int sum2(unsigned int from, unsigned int to); /* iteration */
unsigned int sum3(unsigned int from, unsigned int to); /* algorithm */
/* algorithm: sum(1..n) = n*(n+1)/2, sum(m..n) = sum(1..n) - sum(1..m-1) */


int main(void)
{
    unsigned int s;
    unsigned from, to;
    double t1, t2;

    printf("Enter the fist integer:");
    scanf("%d", &from);
    printf("Enter the second integer:");
    scanf("%d", &to);

    t1 = clock();
    s = sum1(from, to);
    t2 = clock();
    printf("sum1=%d, %fseconds.\n", s, (t2-t1)/CLOCKS_PER_SEC);

    t1 = clock();
    s = sum2(from, to);
    t2 = clock();
    printf("sum2=%d, %fseconds.\n", s, (t2-t1)/CLOCKS_PER_SEC);

    t1 = clock();
    s = sum3(from, to);
    t2 = clock();
    printf("sum3=%d, %fseconds.\n", s, (t2-t1)/CLOCKS_PER_SEC);

    return 0;
}
```

2. (5 marks) Write function v_exchange which swaps the values between x[i] and x[SIZE-1-i] (e.g., swap between x[0] and x[9]). Implement two versions of the function – one version with array notation, the other with pointer notation.

```c
#include <stdio.h>
#define SIZE 10

void v_exchange(int a[]);

int main(void)
{ int i, x[SIZE];    /* x[] has 10 int elements */

  for (i=0; i<SIZE; i++)
    x[i] = i;        /* assign i to x[i] */
  v_exchange(x);     /* call for value exchange */

  for (i=0; i<SIZE; i++)
    printf("x[%d]=%d, &x[%d]=%x\n", i, x[i], i, &x[i]);

  return 0;
}
```

3. (5 marks) Write function `stringcmp` to compare two strings, element by element, for equality. It returns "1" if the two strings are the same and returns "0" if the two strings are different.

```c
#include <stdio.h>

int stringcmp( const char *s1, const char *s2 ); /* prototype */

int main(void)
{ char string1[ 80 ]; /* create a string */
  char string2[ 80 ]; /* create another string */

  printf( "Enter two strings: " );
  scanf( "%s%s", string1 , string2 );
  printf( "The result is %d\n", stringcmp( string1, string2 ) );

  return 0;
}
```

4. (5 marks) Write function `stringlen` to count the length of a string (number of characters, excluding the '\0' character).

```c
#include <stdio.h>

int stringlen( const char *s ); /* prototype */

int main( void )
{  char string[ 80 ]; /* create char array */

   printf( "Enter a string: ");
   scanf( "%[^\n]", string );
   printf( "%d\n", stringlen( string ) );
   return 0;
}
```

Submission Guidelines

a. Each programing question should be a .c file. For example, the program for question 1 should be named as “q1.c”. You need include the code provided with the questions so that the .c file can be compiled.
b. You need provide appropriate comments to make your code readable. (Note that if your code is not working and there are no comments, you may loss all the marks.)
c. We assume C89 standard. If you use C99 features, please highlight with comments.