CS 1713
Introduction to Computer Programming II
Midterm 2

<table>
<thead>
<tr>
<th>Question</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1</td>
<td></td>
</tr>
<tr>
<td>Question 2</td>
<td></td>
</tr>
<tr>
<td>Question 3</td>
<td></td>
</tr>
<tr>
<td>Question 4</td>
<td></td>
</tr>
<tr>
<td>Question 5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
</tr>
</tbody>
</table>

NAME:__________________________________________

Instructions
1. Do all of the 5 problems
3. You have 70 minutes for the exam
4. Show all your work
5. Do not separate midterm papers

Easy         Difficulty Level         Difficult
□ □ □ □ □ □ □ □ □ □
1  2  3  4  5  6  7  8  9  10
1. (20 pts) What is the output of the following program? Show all your work

```c
#include <stdio.h>

int function1(int data[10], int a, int b)
{
    return(data[b]-data[a-1]);
}

int main()
{
    int a[10];
    int i=1, x;

    a[0]=0;
    while (i<10)
    {
        a[i] = i+a[i-1];
        i++;
    }

    for (i=3; i<7; i++)
    {
        x = function1(a,i,i+2);
        printf("%d %d\n",i,x);
    }
}
```
2. (20 pts) What is the output of the following program? Show all your work

```c
#include <stdio.h>

int function1(int *m)
{
    *m = *m + 1;
    return(*m);
}

int function2(int n)
{
    n = n + 2;
    return(n);
}

int main()
{
    int x = 2, y = 4;
    int *ptr = &x;

    printf("Output 1: X = %d, Y = %d\n",x,y);
    x = function2(y);
    printf("Output 2: X = %d, Y = %d\n",x,y);
    x = 2; y = 4;
    y = function1(ptr);
    printf("Output 3: X = %d, Y = %d\n",x,y);
    x = 2; y = 4;
    x = function2(function1(ptr));
    printf("Output 4: X = %d, Y = %d\n",x,y);
    x = 2; y = 4;
    x = function2(function2(y));
    printf("Output 5: X = %d, Y = %d\n",x,y);

    return 0;
}
```
3. (20 pts) C language does not provide a standard function that removing trailing spaces at
the end of a string. Write a **function** to do this. Sample executions of the function and the
function prototype are given below. You can use `strlen()` function in your implementation.
given below.
"Apple " becomes "Apple"
"An apple" becomes "An apple"
"Apple 2" becomes "Apple 2"

```c
char *strtrim(char *str)
{
}
```
4. (20 pts) Consider a coin system where there are coins for 1 cent, 4 cents and 16 cents instead of the 1 cent, 5 cents, 10 cents and 25 cents that we have now. Find out whether optimal change (minimum number of coins) for every amount from 1 cent to 60 cents can be given using at most 3 coins of each type in this system. Verify this using your program or print counterexample you find if there are any. Write a **Complete program** to do this. You can use functions in your program if you want.
5. (20 pts) **Complete the following program** to find the first non-repeating character in a string. Read a string from the user and print the first non-repeating character. **Hint:** first non-repeating character is one of the characters in the string and appears in the string only once.

"appleforapple" has first non-repeating character 'f', since 'a', 'p', 'l', 'e' repeat
"an apple" has first non-repeating character 'n' since 'a' repeats
"abcdedcb" has first non-repeating character 'a' since 'a' is first character and does not repeat

```c
#include <stdio.h>
#include <string.h>

// returns how many times ch appears in str
int countchar(char ch, char *str)
{
    int count = 0;
    while (*str != '\0') {
        if (*str == ch)
            count++;
        str++;
    }
    return(count);
}

int main()
{
    char str[100];
    char *str1;
    char norepeat;
    int done = 0;

    fgets(str,100,stdin);
    str1=str;

    printf("First nonrepeating character is %c\n",norepeat);
    return 0;
}
```
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