CS/SE 3340 - Assignment#3
Due Date: 4/3/19, 11:59 pm

1-Explain the role of compilers, assemblers, and linkers and how programs are translated into machine language and executed (at least one page)

2-Translate the following C++ program to MIPS assembly program (Please explain each instruction of your code by a comment and submit a .asm file)

```cpp
#include <iostream>
using namespace std;
void myfunction(int arr[], int n)
{
    int writes = 0;
    for (int start = 0; start <= n - 2; start++) {
        int item = arr[start];
        int pos = start;
        for (int i = start + 1; i < n; i++)
            if (arr[i] < item)
                pos++;
        if (pos == start)
            continue;
        while (item == arr[pos])
            pos += 1;
        if (pos != start) {
            swap(item, arr[pos]);  //this finction swaps the value of two variables
            writes++;
        }
        while (pos != start) {
            pos = start;
            for (int i = start + 1; i < n; i++)
                if (arr[i] < item)
                    pos += 1;
            while (item == arr[pos])
                pos += 1;
            if (item != arr[pos]) {
                swap(item, arr[pos]);
                writes++;
            }
        }
    }
}

int main()
{
    int arr[] = { 1, 8, 3, 9, 10, 10, 2, 4 };
    int n = sizeof(arr) / sizeof(arr[0]);
    myfunction(arr, n);
    cout << "array : " << endl;
    for (int i = 0; i < n; i++)
        cout << arr[i] << " ";
    return 0;
}
```

3-Translate the following C++ program to MIPS assembly program (Please explain each instruction of your code by a comment and submit a .asm file)

```
#include <iostream>
#include <iomanip>
using namespace std;

int main()
{   const int ADULT_CHOICE = 1,
              CHILD_CHOICE = 2,
              SENIOR_CHOICE = 3,
              QUIT_CHOICE = 4,
              ADULT = 250,
              CHILD = 200,
              SENIOR =350;
   int choice, months;
   int charges=0;
   do
   {
      cout << "\n\t\tHealth Club Membership Menu\n\n"
           << "1. Standard Adult Membership\n"
           << "2. Child Membership\n"
           << "3. Senior Citizen Membership\n"
           << "4. Quit the Program\n\n"
           << "Enter your choice: ";
      cin >> choice;
      while (choice < ADULT_CHOICE || choice > QUIT_CHOICE)
      {
         cout << "Please enter a valid menu choice: ";
          cin >> choice; }

     if (choice != QUIT_CHOICE)
      {
         cout << "For how many months? ";
         cin >> months;
        switch (choice)
         {
            case ADULT_CHOICE:
                 for (int i =0 ; i< months; i++)
                     charges= charges+ ADULT ;
                break;
            case CHILD_CHOICE:
                for (int i =0 ; i< months; i++)
                charges= charges+ CHILD ;

                break;
            case SENIOR_CHOICE:
                for (int i =0 ; i< months; i++)
                charges= charges+ SENIOR ;
         }

         cout << "The total charges are $"
              << charges << endl;
      }
   } while (choice != QUIT_CHOICE);
   return 0;
}
```

4-Translate the following C++ program to MIPS assembly program (Please explain each instruction of your code by a comment and submit a .asm file)

```cpp
#include <iostream>
using namespace std;
int main()
{
     const int CITY = 2;
     const int WEEK = 7;
     int temperature[CITY][WEEK];

    cout << "Enter all temperature for a week of first city and then second city. \n";

    // Inserting the values into the temperature array
    for (int i = 0; i < CITY; ++i)
    {
        for(int j = 0; j < WEEK; ++j)
        {
            cout << "City " << i + 1 << ", Day " << j + 1 << " : ";
            cin >> temperature[i][j];
        }
    }

    cout << "\n\nDisplaying Values:\n";

    // Accessing the values from the temperature array
    for (int i = 0; i < CITY; ++i)
    {
        for(int j = 0; j < WEEK; ++j)
        {
            cout << "City " << i + 1 << ", Day " << j + 1 << " = " << temperature[i][j] << endl;
        }
    }

    return 0;
}
```