Entry no = 2013EE10498

CSL 100: Introduction to Computer Science
Minor II, 23 March 2014, 09:30-10:30 AM
Maximum Marks: 40

1. **[10 Marks]** You are given a 1-Dimensional array A[n] of length n. Write code for copying this array into a 2-Dimensional array B[m][p] such that the first p entries of A are copied into the first row of B, the next p entries of A are copied into the next row of B and so on. You can assume that n=mp.

Example: Suppose n=9, m=p=3, and A[]={5,3,2,7,8,1,6,4,9}. Then B should look like

5	3	2
7	8	1
6	4	9

```
int main() {
  int A[n]; // assume n is some fixed constant
  int B[m][p]; // assume m and p are some fixed values such that m.p=n
int i,j,x; x=0;
  // assume we have read the n values in the array A
  // write code below to copy A into B in the manner described above
for(i=0; i<m; i++)
   for(j=0;j<p; j++)
   { B[i][j]= A[x];
          x++ ;
   }

}
```

2. **[10 Marks]** Write the output of the following programs:

(i)

```
#include <iostream>
bool f(int y, int &x) {
        if (y < x || x > 1)
                return true;
        else {
                x = y%2;
                return false;
        }
}

int main( ) {
        int y,x;
        y = 1;
        for (x= 0; x < 4; x++) {
                if ( f(x, y) )
                        cout << "t y=" << y << "\n";
                else
                        cout << "f y=" << y << "\n";
        }
}
```

ty = 1

(ii)

```
#include <iostream>
int fun (int& x, int y, int z) {
        x = x + z;
        y = y % 3;
        if (x <= 3 || x < z)
                z = 2*z;
        else
                z = z+1;
        cout << "In fun, x=" << x << " y=" << y << " z=" << z << "\n";
        return x + y;
}

int main( ) {
        int x,y,z;
        int y = 1;
        int x = 7;
        int z = fun (y,x,3);
        cout << "In main, x=" << x << " y=" << y << " z=" << z << "\n";
}
```

4 ✓

output

In fun, x = 4 y = 1 z = 4
In main, x = 7 y = 1 z = 5

3. **[10 Marks]** We are given an array containing the following details of 200 countries: area (in square kilometres), population, and name (represented as an array of 100 characters). We wish to arrange the array of countries in increasing order of their population: smallest first, and largest last. Complete the C++ program below to represent and process the data. Specify any assumptions you are making. Do not alter the code already present.

```
#define N 200
// Specify the declaration for country
struct country { char name[100];
                 int population;
                 int area;
               };
void sort ( country XYZ[ ] ){
 for (i = 0; i < N; i++) {
  min = i;
  for (j = i+1; j < N; j++) {
  // keep track of country with minimum population
  // between positions i+1 and N-1
   if ( XYZ[min].population < XYZ[j].population )
    min = j;
  }
  // Complete the function
  swap ( XYZ[min], XYZ[i] ); // Swap is a function
                             // to swap contents
 }
}
int main () { country ABC[200] //data initialised in ABC[200]
 // Assume that data is already initialised
```

8 ✓

XYZ[min].pop > XYZ[j].pop

4. [10 Marks] Continuing the countries example of Question #3, we wish to develop a program that: (1) first prints the names of the countries in increasing order of their population, and (2) then displays the outlines of all the countries graphically, forming a world map.

The program is to be organised into 3 main modules:

i. "**main.cpp**" This file contains the main function, which calls the functions for sorting, printing the sorted country names, and displaying the map.
ii. "**sort-print.cpp**" This file contains the function definitions for sorting and printing the list.
iii. "**display.cpp**" This file contains the function definition for displaying the world map.

Assume the following:

1. Each country's outline on the map is represented by an array of (maximum 50) points, each represented by x- and y-co-ordinates.
2. A function "void draw_line (int a, int b, int p, int q)" is available in file "util.h" for drawing a straight line from co-ordinate (a,b) to (p,q) on the graphical display. This function is applied to the sequence of co-ordinates to draw the country's outline on the map. The co-ordinates are already stored in the required sequence.

Fill in the code for the files in the boxes below. Add additional files as necessary and show the contents. Remember to compose and include appropriate header (.h) files so that separate compilation works correctly. Marks will be given for elegance of your design.

```
// main.cpp
#include <iostream>
#include "A.h"
// A.h contains all function
// declarations.
coordinate X[200][2];
// X contains all coordinates
int main () {  country ABC[200]
  // Assume: data is initialised
  sort ( ABC );
  print ( ABC );
  display ( ABC , X[ ][ ] );
}
// Declaration coordinate
// is in Display.cpp
```

```
// sort-print.cpp
#include <iostream>

void sort ( country XYZ[] ) {
  // IGNORE THE FUNCTION DEFINITION
}
void print ( country XYZ[] ) {
int i=0,j=0;
for (i=0; i<200; i++)
{ while (XYZ[i].name[j]!='\0')
  { cout<< XYZ[i].name[j] ; j++; }
cout<<endl;
}
```

```
// display.cpp
#include <iostream>
#include <util.h>
void display ( country XYZ ) {

// next page
```

```
// util.h  Don't change this file.

void draw_line (int a, int b, int x, int y);
```

```
// util.cpp  Don't change this file.

void draw_line (int a, int b, int x, int y) {
  // IGNORE THE FUNCTION DEFINITION
```