

Ollscoil na hÉireann, Gaillimh
National University of Ireland, Galway

GX 1612

Semester II Examinations, 2002/2003

Exam Code(s)	<u>2BA1</u>
Exam(s)	<u>BA1 B.A. Degree</u>
Module Code(s)	<u>CT243</u>
Module(s)	<u>Programming - Data Structures</u>
Paper No.	<u>1</u>
Repeat Paper	<u>Special Paper</u>
External Examiner(s)	<u>Professor D. Bell</u>
Internal Examiner(s)	<u>Professor G. Lyons</u>
	<u>Dr. M. Mc Gettrick</u>

Instructions

Answer 4 questions.
All questions will be marked equally.

Duration	<u>2hrs</u>
No. of Answer Books	<u>1</u>

Requirements

Handout	<u> </u>
MCQ	<u> </u>
Statistical Tables	<u> </u>
Graph Paper	<u> </u>
Log Graph Paper	<u> </u>
Other Material	<u> </u>

No. of Pages	<u>3</u>
Department(s)	<u> </u>

1. (a) Describe two different sorting algorithms that can be used to order a list of n objects. Compare the two algorithms you describe, stating which (if either) is more efficient. Illustrate both by showing (step by step) how the letters in the string "COLUMBIA" ($n = 8$) are ordered by each algorithm.

(b) Using a Sub procedure

```
Public Sub MergeSort(List() As Integer, Temp() As Integer, _  
    Min As Integer, Max As Integer)
```

or otherwise, write Visual Basic code to perform merge sort on an array List() of numbers.

2. (a) Suppose we want to "unsort" (or jumble) a list that was previously sorted (e.g. we want to "shuffle" the cards in a card game). Using a Sub procedure

```
Public Sub UnSort(List() As Integer, Min As Integer, Max As Integer)
```

and the Rnd function, or otherwise, write Visual Basic code to shuffle an array List() of numbers.

- (b) Given a two-dimensional array km(i,j) of distances (in kilometers) between 20 cities (so i and j run from 1 to 20, km(i,j) = km(j,i) and km(i,i) = 0) write a Visual Basic Sub procedure

```
Public Sub ShowNearest(Km() As Integer, Row As Integer)
```

which, for a given city (indexed by Row) calculates the nearest city to it, and outputs in a picture box (picOut) both the index of the nearest city and its distance (assume all the distances in km(i,j) are different).

3. (a) Explain the following file access modes in Visual Basic giving a short example of each: output, input, append, random.

- (b) Explain the difference between the EOF() and LOF() functions in Visual Basic. Describe how LOF() may be used to calculate the number of records in a Random (Access) File.

- (c) Consider the following Visual Basic code:

```
Private Sub WriteToFile_Click()  
    Open "phone.txt" for Output as #1  
    Write #1, "+353-1-1234567"  
    Close #1  
End Sub
```

Given that the "File not found" error has associated error number 53, and "Disk full" has error number 61, re-write the above code adding error handling for both these errors. For the "File not found" error the user should be asked to enter a different file name, and for the "Disk full" error a Common Dialog Control should be presented to allow the user to make space by deleting a file.

4. Assume the text file `rain.txt` contains monthly rainfall values (in millimeters) for Galway City over the past ten years. Each line contains 12 integers (one for each month), with the first line representing 2002, the second 2001, etc., back to 1993. Write a Visual Basic program to display as either a pie chart or as a bar chart (histogram) the monthly rainfall for a given year. In your initial form you should have

- A text box (with a suitable label) where the year can be typed in (if a year outside the range is entered a suitable error message should be presented).
- A control button to display a bar chart for the year entered.
- A control button to display a pie chart for the year entered.

Write the procedures for displaying the relevant charts, and state the objects used in your form and their property settings. In your pie chart, ensure neighboring "slices" of the pie have either different color or shading. Assume (for your bar chart) that all of the rainfall values are less than 200 millimeters.

5. Describe each of the following. In each case give a short example (code fragment) showing the use of the control or function in question.

- The `RGB()` function.
- The Timer Control.
- The Vertical Scroll Bar Control.
- The Shape Control.
- The `Dir()` function.
- The `Len()` function.

6. (a) Describe four main properties of the Data Control in Visual Basic.

- (b) Suppose we have created a database `megacity.mdb` which has a single table called `cities` with four fields: City, Country, Population in millions (of the City), and a boolean (true/false) value indicating whether or not the city is a capital city. A sample of entries in the table follows.

City	Country	Population	Capital
Roma	Italia	3.8	True
Sevilla	España	1.2	False
Hamburg	Deutschland	0.8	False
Den Haag	Nederland	0.4	True

Using the Data Control, develop a Visual Basic program that allows the user to read the values in the table and to update (change) the current population. Name all the objects you use and state the relevant property settings. Use the `Validate` event procedure to prevent the user from entering a negative number for the population.