

Please answer the following questions using separate paper provided by the instructor. Question point values are shown in parentheses.

Questions 1 and 2 refer to the following “Bubble Sort” code from the text.

```
Public Sub BubbleSort(A() As Single, ByVal LastCell As Integer)  
  
  Dim J As Integer  
  Dim NoExchangeI nPass As Integer  
  
  NoExchangeI nPass = False  
  Do Until NoExchangeI nPass  
    NoExchangeI nPass = True  
    For J = 1 To LastCell - 1  
      If A(J) > A(J + 1) Then  
        Swap A(J), A(J + 1)  
        NoExchangeI nPass = False  
      End If  
    Next J  
    LastCell = LastCell - 1  
  Loop  
End Sub
```

1. (12) Write the **complete** Swap procedure that is referenced in the code above.
2. (12) What function does the variable “LastCell” serve? Why does its value decrease by 1 as the loop repeats?
3. (15) Write a **complete** VB function that computes the factorial of an integer (N). The factorial of N is defined as the product of the numbers between 1 and N. For example, 5 factorial (written symbolically as 5!) is  $1 \times 2 \times 3 \times 4 \times 5 = 120$ .
4. (10) Assume that you want to store information on the courses that you have taken at the university. For each course, you want to store the course identifier (like IS 320), the course description (25 characters max), the credits (an integer number), and the grade you received.

Define a programmer-defined type to store this information. Then create an array (one array only) using this type. The array should

have the capacity to store information for 12 quarters (1 to 12) with up to 5 courses per quarter. Thus you will be able to refer to specific course information for each course taken for each quarter.

5. (15) You are given the following code:

```
Type TDisk
  serialNo As String * 10
  manufacturer As String * 15
  capacity As Integer
End Type
```

```
Type TComputer
  serialNo As String * 5
  desc As String * 20
  numDisks As Integer ' a number £ 5
  diskInfo(1 To 5) As TDisk
End Type
```

```
Dim ComputerList(1 To 50) As TComputer
```

Assume that data has been stored into the array ComputerList. Also assume that a variable named “numComputers” is equal to the actual number of computers stored in the array (where  $\text{numComputers} \leq 50$ ).

Write a code segment that computes the average disk capacity per computer computed over all the computers in the array (one average only). That is, if there are two computers, with computer 1 having three disks with capacities of 200, 400, and 600 megabytes, and computer 2 having two disks with capacities of 500 and 800 megabytes, then the average capacity is 1,250 megabytes. Be sure that the code segment works without modification if the number of computers in the list changes.

6. (12) In the context of a database recordset, there are a set of “Move” methods (e.g., MoveNext) and a set of “Find” methods (e.g., FindNext). How are these two sets of methods similar? How are they different?
7. (12) What is a recordset? How are recordsets and database tables similar? How are they different?
8. (12) How are programmer-defined data types and objects similar? How are they different?

**Answer Key**

1. The Swap procedure follows:

```
Public Sub Swap(A As Single, B As Single)  
Dim Temp As Single  
  
Temp = B  
B = A  
A = Temp  
End Sub
```

2. “LastCell” points to the end of the “unsorted” elements of the array—values after LastCell are sorted. That is, the algorithm puts the elements from LastCell to the end into their proper sorted order. It gets decremented by 1 each pass because each pass moves a new value to the “sorted” end of the array.
3. A factorial function is:

```
Public Function factorial(ByVal N As Integer) As Long  
Dim f As Long, i As Integer  
  
f = 1  
For i = 2 To N  
    f = f * i  
Next i  
factorial = f  
End Function
```

4. The type definition and array declaration is:

```
Private Type TCourse  
    CourseId As String  
    CourseDesc As String  
    Credits As Integer  
    Grade As Currency  
End Type  
  
Dim CourseArray(1 To 12, 1 To 5) As TCourse
```

5. The code segment to compute the average disk capacity per computer is:

```
For c = 1 To numComputers  
    For d = 1 To ComputerList(c).numDisks  
        s = s + ComputerList(c).diskInfo(d).capacity  
    Next d  
Next c  
  
average = s / numComputers
```

6. They are similar in that they “move” through the records of a recordset. They differ because the “Move” methods go through *each* record of the Recordset (each physical record) while the “Find” methods go through a set of *logical* records (determined by the criteria defined in the Find method).
7. A recordset is the collection of records associated with a data control (as specified by the RecordSource property). The RecordSource can be a single table in the database or it can be the result of an SQL query statement. In the case of the SQL query, the recordset can be a combination of several tables or a subset of records from a single table.
8. Programmer-defined types and objects are similar in that they both include data (of potentially heterogeneous types).

Programmer-defined types and objects are different because objects also have behavior associated with them (programmer-defined types do not have behavior). For example, the SlidingWindow class defined the “add” behavior—an object of this class knew how to add numbers to its internal list of numbers (its instance variable).