

ICT3611May/June 2015
Mei/June 2015**ADVANCED GRAPHICAL USER INTERFACE PROGRAMMING
GEVORDERDE GRAFIESE GEBRUIKERSKOPPELVLAKPROGRAMMERING**Duration 2 Hours
Tydsduur 2 Uur75 Marks
75 Punte**EXAMINATION PANEL AS APPOINTED BY THE DEPARTMENT
EKSAMENPANEEL SOOS DEUR DIE DEPARTEMENT AANGEWYS.****Closed book examination.
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Instructions:

1. This examination paper consists of two sections answer all questions in a section
2. Only answer the section applicable to you, do not answer both Do not answer some questions from section I and some from section II you will be awarded 0
3. Answer section II only if you are an FI, supplementary, or ægrotat student Otherwise answer section I. Clearly indicate which section you are answering in your exam book
4. Write down the question number and your answer next to it in the exam script. Do not write answers on the question paper the question papers will not be marked, only the exam scripts will be marked
5. Section I. For questions where you have to provide missing code write down the question number, the number next to the open line, and the code for that line. For example: 2 1 (1) MsgBox("Code!")
6. Read the questions carefully before attempting to answer them, plan your time carefully, write neatly and legibly.
7. This paper consists of 10 pages

[TURN PAGE]

Section I

DO NOT ANSWER IF YOU ARE AN FI, SUPPLEMENTARY, OR AEGROTAT STUDENT

Question 1 Multiple Choice [15]

Write down the question number and your choice

- (1) An instance of a class is also known as [1]
A a running class.
 B an object
C a template object.
D a template class
- (2) Which one of the following defines the characteristics of an object and the data associated with that object? [1]
A Methods
B Classes
 C Properties
D Fields
- (3) To access member 'name' of a form from within the form, you may use the statement [1]
 A Me.name
B Class.name
C Form.name
D This.name
- (4) An access modifier is used to indicate [1]
A that a procedure can be modified
 B that a procedure can be called from other classes
C that a procedure cannot be modified
D that a procedure can return a value
- (5) Consider the following snippet of code:

```
Public Sub swap(A as Integer, B as Integer)  
    Dim temp as Integer = A  
    A = B  
    B = temp  
End Sub
```


Suppose C = 10 and D = 20, and that we call swap(C,D) What is the value of C and D when the call returns? [1]
A. C = 20, D = 10
B. C = 20, D = 20
C. C = 10, D = 10
 D. C = 10, D = 20

[TURN PAGE]

- (6) When a class definition does not contain code for a constructor Visual Basic will [1]
- A generate code to initialise the instance variables for the object
 - B generate code for a parameterless constructor for the object which contains code used to initialise the instance variables for the object.
 - C generate code for a parameterless constructor which contains no code in its body
 - D report a 'missing constructor' error during compilation
- (7) To write non-string data to a text file (which stores string data) you have to [1]
- A manually convert the data to a string using procedures such as CStr and CInt before writing the data.
 - B call a method in the stream object to indicate that the next data to be written will not be string data
 - C write the data as it is, there is no need to convert it at all.
 - D write the data as it is, it will be converted by the writing function.
- (8) Suppose you have three fields a name, surname, and year (for example Robert Fischer 1972) Which one of the following is the correct way of writing a record to a text file identified by the object variable f? [1]
- A f.WriteLine('RobertFischer1972' & VbCrLf)
 - B f.WriteLine('Robert,Fischer,1972' & VbCrLf)
 - C f.Write('RobertFischer1972' & VbCrLf)
 - D f.Write('Robert,Fischer,1972' & VbCrLf)
- (9) Consider the following snippet of code which should read a line from a file and display it as long as there is data available: [1]

```

While True
  line = rdr.ReadLine()
  If line = "" Then
    MsgBox("End of File Reached")
    Exit While
  Else
    MsgBox("Just Read a line!:" & line)
  End If
While End

```

When you execute this snippet of code, you notice that it does not always read an entire file. How would you fix the problem (without introducing a new problem)? [1]

- A. Remove the Exit While Statement
- B. Replace True with line <> "", and replace the entire If Then Else with MsgBox("Just Read a Line! " & line)
- C Replace True with rdr.Peek <> -1, and replace the entire If ..Then..Else with MsgBox("Just Read a Line!." & line)
- D. Replace line = "" with rdr.Peek = -1

[TURN PAGE]

- (10) The term 'Relational' in Relational Database refers to [1]
 A the concept of relations to hold data
B the relationships that exists between fields.
C the relationships that exists between keys in tables.
D. the relationships that exists between tables
- (11) The disconnected data architecture is more advantageous than the client/server paradigm because [1]
A it is easier to maintain data across multiple systems than with the client/server approach
B disconnected data sources are inherently protected against hacking attempts by fraudsters who want to access data
 C it offers improved system performance over client/server because less resources are required on the server
D. disconnected data sources are split and the local system does not have to waste time communicating with the server
- (12) Suppose class B inherits from class A. You may [1]
A only pass objects of class A as an argument to procedures that expect objects of class A
B only pass objects of class B as an argument to procedures that expect objects of class A
C pass objects of class A as an argument to procedures that expect objects of class B
 D pass objects of class B as an argument to procedures that expect objects of class A
- (13) XML can be used to [1]
A handle certain types of Exceptions when thrown by systems on the network
B determine if a system supports mobile language extensions
C authenticate users by querying remote systems for passwords and usernames
 D to exchange data between different systems, especially via the internet
- (14) The following is a specification language which provides a way for clients to discover the services offered by the provider: [1]
 A WSDL
B XML
C HTML
D. HTTP

(15) Consider the following code snippet

```
Public Sub printAlert(ByVal msg As String)
    Throw New Exception("Exception")
End Sub

Public Sub A()
    Try
        printAlert("Testing a throw")
    Catch ex As Exception
        MsgBox("Caught exception")
        Throw ex
    Finally
        MsgBox("In the finally block")
    End Try
End Sub

Sub Main()
    Try
        A()
    Catch ex As Exception
        MsgBox("Caught exception in sub main()")
    End Try
End Sub
```

Which messages will be displayed in message boxes if this program is run? [1]

- A "In the finally block", followed by "Caught exception in sub main()".
- B "Caught exception" followed by "In the finally block"
- C "Caught exception" followed by "In the finally block" followed by "Caught exception in sub main()"
- D. None The code won't compile

Question 2

Error Handling

[6]

- (1) Consider the following snippet of code which calls a function called `summation(n As Integer) As Integer` in a library. `summation` calculates the sum of the first n negative integers. Since, the creator of the function ensured that it cannot be called with a positive integer it throws a `PositiveIntegerException` when it is called with a positive valued parameter. Complete the snippet of code in order to make use of the `summation` function. [6]

```
Dim m (1) As integer
Dim n As Integer = InputBox("Enter A negative Value")

(2) Try
    m = (3) Summation (n)
(4) Catch e As positiveIntegerException
    MsgBox("Cannot pass a non-negative integer .")
End Try
```

[TURN PAGE]

Question 3 Objects and Classes [16]

- (1) Complete the following snippet of code by providing missing line of code. [7]

```
Public (1) MustInherit Class Car
    (2) Protected col As String
    Public (3) ReadOnly Property colour() As String
        Get
            return (4) Col
        End Get
    End Property

    MustOverride Function
    Public (5)      calcO2Tax(rate as Double)   
        As Double
End Class
```

- (2) Write the code for a class called SUV which inherits from the Car class in the previous question. Write the code for the calcO2Tax function based on the following rules: [9]

1. A vehicle with an emission rate less than 100 is taxed at R500 25,
2. A vehicle with an emission rate that doesn't match rule 1 but is less than 1000 is taxed at R2500 00,
3. A vehicle with an emission rate that doesn't match any of the previous rules is taxed at R5700 67

Write the class definition as well as the code for the function!

Question 4 Files and Data [18]

- (1) Define a structure called Person which will store the surname, initials, and age of a person [5]

<p>(2) Consider the following content of a text file:</p> <pre>Saunders ,H, 22 Vahed ,P, 24 Naidoo ,A, 33 Mabila ,Q, 22</pre>	<pre>Structure Person Dim Surname As string Dim initials As String Dim age As integer End structure</pre>
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Values are separated with a comma. and the fields are. surname, initial, age

- i. Consider the following function procedure ReadEntries which will read the content of the file and return it to the calling function

ReadEntries will:

- Take the name of the file to read the data from as a parameter
- Store the data in the Person structure defined in the previous question.
- Return a list of type Person which contains all the data read from the file
- Be able to read an unspecified number of persons' data from the file.

Complete the code by providing the missing lines of code. [13]

```

Public (1) Function ReadEntries(_
ByVal filename As String) As (3) List(of person)
    Dim persons() As List(of Person)
    (4) Dim strmrd As System.IO.StreamReader
    strmrd = New (5) System.IO.StreamReader(filename)

    Do Until (6) strmrd.EndOfStream
        Dim line = (7) strmrd.ReadLine
        Dim dat() As String = line Split(, ',')
        Dim t as Person
        t (8) Surname = dat(0)
        (9) t.initials = dat(1)
        (10) t.age = dat(1)
        persons.add(t)
    Loop

    (11) strmrd.close()

    return (12) Persons
End Function

```

Question 5	Databases	[18]
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- (1) Discuss the similarities between the structure of data stored in text files, and data stored in a database. [3]
- (2) Discuss the use of the QueryBuilder to create SQL statements. Provide an example [5]
- (3) Consider the following code snippet which uses a parameterised query to get data from a database. Complete the code by providing the missing lines of code. [10]

```

Public Function getStudent(stud_no As String) As Student
    Dim stud As Student
    Dim connection (1) As sqlConnection = MySQLBooksDB.GetConnection
    Dim selectStatement As String = _
    "Select Name, Address " & _
    "FROM Customers WHERE CustomerID = @CustomerID"
    Dim selectCommand As New (2) SqlCommand(selectStatement, Connection)
    (3) SelectCommand.parameter.AddWithValue("@CustomerID"
    CustomerID)
    Try
        connection.Open()
        Dim reader As SqlDataReader = _
        selectCommand.ExecuteReader(CommandBehaviour.SingleRow)
        if (4) reader.Read Then
            stud.studNo = stud_no
            stud.Name = (5) reader("name").ToString()
            stud.Address = (6) reader("Address").ToString()
        end if
    Catch
    End Try
End Function

```

[TURN PAGE]

```
Else
  stud = Nothing
End If
(7) reader.close()
Catch (8) Ex As SQLException
  Throw ex
Finally
  (9) Connection.close()
End Try
Return stud
End Function
```

Question 6	Web-services	[2]
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- (1) Clearly explain what SOAP is, it's relation to other protocols, and the role XML plays in SOAP [2]

Total: 75

[TURN PAGE]

Section II

ANSWER ONLY IF YOU ARE AN FI, SUPPLEMENTARY, OR AEGROTAT STUDENT

Question 1	Error Handling	[8]
<p>(1) Explain what is meant by "structured error handling" in VB NET [2]</p> <p>(2) You are provided with a function called <code>summation(n As Integer) As Integer</code> in a library. This function calculates the sum of the first n negative integers. Since, the creator of the function ensured that it cannot be called with a positive integer it throws a <code>PositiveIntegerException</code> when it is called with a positive valued parameter. Write a snippet of code which will call the <code>summation</code> function, making sure to show a message in the event of an error [6]</p>		
Question 2	Modules and Procedures	[5]
<p>(1) Differentiate between declaring a form variable public and declaring it private. [2]</p> <p>(2) Clearly explain why one would place a function procedure in a module as opposed to placing it in a form. Does this mean we should never place function procedures in forms? Clearly explain your answer [3]</p>		
Question 3	Files and String manipulation	[28]
<p>(1) Declare a record in VB syntax which will be used to store a student's full name (no longer than 100 characters), a module (course) code (no longer than 7 characters), and their year and examination mark. [6]</p> <p>(2) Consider the following content of a text file.</p> <pre>Saunders ,H ,23 Vahed ,P ,45 Naidoo ,A ,23 Mabila ,Q ,20</pre> <p>Values are separated with a comma, and the fields are. surname, initial, age</p> <p>i. Create a function procedure <code>CountAges</code> which accepts an integer, and string as parameters and returns an integer. The integer parameter represents an age, and the string parameter is the name of a file on disk. The function scans the file (which has the same format as provided above) and counts all the entries that have an age matching the integer parameter passed to it. For example, the function returns 2 if called with 23 (using the data provided above). You may assume the file exists (there is no need to determine if it exists) [13]</p> <p>ii. Write a function procedure called <code>AgeFrequency</code> which accepts a file name, and an integer as parameters and returns the age frequency for the integer parameter. The age frequency is the number of times an age occurs in a file divided by the number of entries in the file (the format of the file will be as provided at the start of this question). Assume a function called <code>CountAges</code></p>		

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exists. `CountAges` accepts an age (integer) and a file name (string) as parameters and returns an integer indicating the number of times the age appears in the file. Also assume a function called `CountEntries` exists which accepts a file name (string) as parameter and returns the number of entries (lines) in the file (the format of the file will be as provided at the start of this question). Use the `CountAges`, and `CountEntries` functions described to write the `AgeFrequency` function. (Hint: Start by writing down the steps you need to take to get a working solution). Do not assume the file exists. [7]

- iii There is an obvious error that can occur when performing the frequency calculation, what is this error? How would you avoid it? [2]

Question 4	Classes and Objects	[25]
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- (1) Explain why it is generally not a good idea to store user input in GUI control value fields, and how this problem can be avoided (aside from disabling editing on the control). [2]
- (2) Construct a simple design for an application that manages the renting of boats to customers at a marina. Make use of the Model-View-Controller paradigm in your design. (Hint: Make sure to allow boats to be assigned to customers. Provide a diagram to illustrate your design). Explain the function of each element of your design. [6]
- (3) Write a snippet of code which defines an abstract base class to represent Cars at a car rental agency. Provide a property for the car's type (sedan, hatch-back, SUV, 4x4, and so on). It should not be possible to change the car's type. For rental cars the base fare is calculated differently for four-wheel drive and sedans. Provide an abstract function definition called `BaseFare` which will calculate the base fare (it takes an integer representing the number of days the car will be rented). [14]
- (4) Clearly explain what a default constructor is in VB, and provide a snippet of code to show what one looks like. [3]

Question 5	ADO NET	[9]
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- (1) Explain the mechanism ADO NET uses to ensure that data can be accessed in a uniform way. [3]
- (2) Explain how a `DataGridView` control works on a high-level. [3]
- (3) Explain why one has to issue a command in ADO NET to write changes in the dataset to the database. What is this type of arrangement called? [3]

Total: 75