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COMPUTER SCIENCE **9608/21**

Paper 2 **May/June 2017**

MARK SCHEME

Maximum Mark: 75

Published

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>Input:
• Enter data into the system // get / receive / read data
• <code>INPUT MyVar // READFILE MyFile, MyString</code>

Process:
• Manipulate / change data in some way // perform a calculation / find a result
• <code>MyChar ← 'X' // MyNum ← MyNum + 1</code>

Output:
• Send data out from the system // display / print / transmit / show data
• <code>OUTPUT "Hello World" // WRITEFILE MyFile, MyString</code>

Mark as follows:
1 mark for each type (in bold)
1 mark for each description and pseudocode example</td><td>7</td></tr>
<tr><td>1(b)(i)</td><td>Boolean</td><td>1</td></tr>
<tr><td>1(b)(ii)</td><td>Logical / Boolean</td><td>1</td></tr>
<tr><td>1(b)(iii)</td><td><table><tr><th>Expression</th><th>Evaluates to</th></tr><tr><td><code>FlagA AND (FlagB OR FlagC)</code></td><td>TRUE</td></tr><tr><td><code>FlagA AND (FlagB AND FlagC)</code></td><td>FALSE</td></tr><tr><td><code>(NOT FlagA) OR (NOT FlagC)</code></td><td>FALSE</td></tr></table>
1 mark per answer</td><td>3</td></tr>
<tr><td>1(c)</td><td><pre>MyCount ← 100

WHILE MyCount < 201

   Output MyCount

   MyCount ← MyCount + 2

ENDWHILE</pre>1 mark for each of the following:

• Counter initialisation
• While ... End loop
• Method for choosing (correct range of) even numbers
• Output all even numbers in the range

Note: Counter variable name must be consistent</td><td>4</td></tr>
</table>

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Question	Answer	Marks
2(a)	Stepwise refinement	**1**
2(b)	1 mark for first 2 data types – String 1 mark for last 2 data types – Boolean 1 mark for each description: `PasswordInput` Stores password entered `UserIDFound` True if user ID found in the file `PasswordValid` True if password entered matches password from file //Input password matches stored password	**5**
2(c)	1. LOOP through the file until EOF… 2. …OR `UserIdInput` is found 3. READ text line from `Password.txt` file **in a loop** 4. SPLIT into `UserID` and password **in a loop** 5. IF `UserIdInput` matches `UserID` from file THEN **in a loop** 6. SET `UserIDFound` to `TRUE` **in a loop** 7. IF `UserIDFound = TRUE` AND `PasswordInput` matches value from file THEN 8. Set `PasswordValid` to `TRUE` Mark as follows: 1 mark per functional equivalent of each numbered statement.	**8**

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Question	Answer	Marks

3	`FUNCTION StringClean(Instring STRING) RETURNS STRING`
	`  DECLARE NextChar : CHAR`
	`  DECLARE OutString : STRING`
	`  OutString ← ""  // initialise the return string`
	
	`  // loop through Instring to produce OutString`
	`  FOR n ← 1 TO LENGTH(InString)  // from first to last`
	`  NextChar ← MID(Instring, n, 1) //get next character and`
	`  NextChar ← LCASE(NextChar) //convert to lower case`
	
	`  IF NextChar >= 'a' AND NextChar <= 'z' //check if alphabetic`
	`  THEN`
	`  OutString ← OutString & NextChar //add to OutString`
	`  ENDIF`
	`  ENDFOR`
	
	`  RETURN OutString  // return value`
	`ENDFUNCTION`
	
	One mark per **underlined** word / expression
		11

Question	Answer	Marks
4(a)	• The hierarchy of modules • Parameters that are passed between modules // The interface between the modules / • The sequence • Iteration / selection One mark per item	**3**
4(b)	`FUNCTION CardPayment (ParamA : REAL, ParamB : STRING) RETURNS BOOLEAN` One mark per underlined part Order not significant for `ParamA` and `ParamB` Function name and parameter names not important but must be present	**3**

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Question	Answer	Marks

5	Pseudocode solution included here for development and clarification of mark scheme.
	Programming language **example** solutions appear in the **Appendix**.
	
	`PROCEDURE SearchFile()`
	
	`DECLARE FileData : STRING`
	`DECLARE MyArrayRow : INTEGER`
	`DECLARE SearchID : STRING`
	`MyArrayRow ← 0 / 1`
	`OPEN "Loginfile.txt" FOR READ`
	`INPUT SearchID`
	
	`WHILE NOT EOF("Loginfile.txt")`
	`  READFILE "Loginfile.txt", Filedata`
	`  IF SearchID = LEFT(FileData,5)`
	`  THEN`
	`  LoginEvents[MyArrayRow,1] ← MID(Filedata, 6, 4)`
	`  LoginEvents[MyArrayRow,2] ← RIGHT(Filedata, 14)`
	`  MyArrayRow ← MyArrayRow + 1`
	`  ENDIF`
	`ENDWHILE`
	
	`CLOSEFILE("LoginFile.txt")`
	
	`ENDPROCEDURE`
	
	1 mark for each of the following:
	
	1. Procedure heading and ending
	2. Declare `MyArrayRow` as integer // commented in python
	3. Initialising `MyArrayRow`
	4. Input `SearchID`
	5. Open file `"LoginFile.txt"` for input / read
	6. Correct loop incorporating `EOF()`
	7. Read a line from the file **in a loop**
	8. Compare `SearchID` with correct data from file **in a loop**
	9. Assign both values to `LoginEvents[MyArray]` **in a loop**
	10. Increment `MyArrayRow` correctly **in a loop**
	11. Close the file **not in a loop**
		10

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Question	Answer	Marks

6(a)	Pseudocode solution included here for development and clarification of mark scheme.
	Programming language solutions appear in the Appendix.
	
	`FUNCTION ValidatePassword(InString : STRING) RETURNS BOOLEAN`
	`DECLARE LCaseChar, UCaseChar, NumChar, n : INTEGER`
	`DECLARE NextChar : CHAR`
	`DECLARE ReturnFlag : BOOLEAN`
	`ReturnFlag ← TRUE`
	`LCaseChar ← 0, UCaseChar ← 0, NumChar ← 0`
	
	`FOR n ← 1 TO LENGTH(InString)`
	`  NextChar ← MID(InString,n,1)`
	`  IF NextChar > = 'a' AND NextChar < = 'z'`
	`  THEN`
	`  LCaseChar ← LCaseChar + 1`
	`  ELSE`
	`  IF NextChar > = 'A' AND NextChar < = 'Z'`
	`  THEN`
	`  UCaseChar ← UCaseChar + 1`
	`  ELSE`
	`  IF NextChar > = '0' AND NextChar < = '9'`
	`  THEN`
	`  NumChar ← NumChar + 1`
	`  ELSE`
	`  ReturnFlag ← False  //invalid character`
	`  ENDIF`
	`  ENDIF`
	`  ENDIF`
	`ENDFOR`
	
	`IF Not (LCaseChar>=2 AND UCaseChar>= 2 AND NumChar>= 3)`
	`  THEN`
	`  ReturnFlag ← FALSE`
	`ENDIF`
	`RETURN (ReturnFlag)`
	`ENDFUNCTION`
	
	1 mark for each of the following:
	
	1. Correct Function heading and ending
	2. Declaring three counter variables (upper, lower, numeric)
	3. Initialising counters
	4. Correct loop
	5. Picking up `NextChar` from `InString`
	6. Check and count number of lower case
	7. Check and count number of upper case
		10

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Question	Answer	Marks
6(a)	8. Check and count number of numeric 9. Check for invalid character 10. Combine all four tests into a single Boolean value 11. Returning correct Boolean value	

6(b)(i)	**String1: (e.g. "AAbb123")**
	
	One mark for a valid string having:
	• at least 2 uppercase alphabetic
	• at least 2 lowercase alphabetic
	• at least 3 numeric characters
	• No other character
	
	String2 – String5:
	
	One mark for correct string **and** explanation (testing different rules of the function)
	
	Test strings breaking **different** rules:
	• With incorrect numbers of:
	  • Lower case characters
	  • Upper case characters
	  • Numeric characters
	• Containing an invalid character
		5

6(b)(ii)	White Box	**1**
6(b)(iii)	• Testing may be carried out before the modules are developed // not ready for full testing • Module stubs contain simple code to provide a known response // temporary replacement for a called module	**2**

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Programming Solutions

Programming Code Example Solutions

Q5 : Visual Basic

```
Sub SearchFile()
   Dim FileData As String
   Dim SearchID As String
   Dim ArrayIndex As Integer

   ArrayIndex = 1
   FileOpen(1, "LoginFile.txt", OpenMode.Input)
   SearchID = Console.Readline()

   Do While Not EOF(1)
      FileData = LineInput(1)
      If SearchID = LEFT(FileData, 5) Then
         LoginEvents(ArrayIndex, 1) = Mid(Filedata, 6, 4)
         LoginEvents(ArrayIndex, 2) = Right(Filedata, 14)
         ArrayIndex = ArrayIndex + 1
      End If
   Loop
   FileClose(1)
End Sub
```

Alternative:

```
Sub SearchFile()
   Dim FileData As String
   Dim SearchID As String
   Dim ArrayIndex As Integer
   Dim MyFile As System.IO.StreamReader

   ArrayIndex = 1
   MyFile = Mycomputer.FileSystem.OpenTextFileReader("Loginfile.txt")
   SearchID = Console.Readline()

   Do While MyFile.Peek < > -1
      FileData = MyFile.Readline()
      If SearchID = LEFT(FileData, 5) Then
         LoginEvents(ArrayIndex, 1) = Mid(Filedata, 6, 4)
         LoginEvents(ArrayIndex, 2) = Right(Filedata, 14)
         ArrayIndex = ArrayIndex + 1
      End If
   Loop
   MyFile.Close
End Sub
```

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Q5 : Pascal

```
Procedure SearchFile();

   var FileData   : String;
   var SearchID   : String;
   var ArrayRow   : Integer;
   Var MyFile     : Text;

   Begin
      ArrayRow := 1;
      Assign(MyFile, "Loginfile.txt");
      Reset(MyFile);
      Readln(SearchID);

      While NOT EOF(MyFile) do
      Begin
          Readln(MyFile, FileData)
          IF SearchID = LeftStr(FileData,5) then
              Begin
                  LoginEvents[ArrayRow,1] = Copy(FileData,6,4);
                  LoginEvents[ArrayRow,2] = Rightstr(FileData,14);
                  ArrayRow = ArrayRow + 1
              End;
      End;

      Close(MyFile);
   End.
```

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Q5 : Python

```
def SearchFile():

   # FileData : STRING
   # ArrayRow : INTEGER
   # SearchID : STRING

   ArrayRow = 0
   MyFile = open("Loginfile.txt", 'r')
   SearchID = input()
   FileData = MyFile.readline()

   While FileData != ""
      If SearchID = = FileData[:5]                  #First 5 characters
         LoginEvents[ArrayRow][1] = FileData[5:9]   #next 4 characters
         LoginEvents[ArrayRow][2] = FileData[-14:]  #last 14 characters
         ArrayRow = ArrayRow + 1
      FileData = MyFile.readline()


   myFile.close()
   return()
```

Alternative:

```
def SearchFile():

   # FileData : STRING
   # ArrayRow : INTEGER
   # SearchID : STRING

   ArrayRow = 0
   Myfile = open("Loginfile.txt", 'r')
   SearchID = input()
   For FileData in MyFile
      IF SearchID = = FileData[:5]                  #First 5 characters
         LoginEvents[ArrayRow][1] = FileData[5:9]   #next 4 characters
         LoginEvents[ArrayRow][2] = FileData[-14:]  #last 14 characters
         ArrayRow = ArrayRow + 1

   MyFile.close()
   return()
```

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Q6 (a): Visual Basic

```
Function ValidatePassword(InString As String) As Boolean
   Dim LCaseChar, UCaseChar, NumChar As Integer
   Dim NextChar As Char
   Dim ReturnFlag As Boolean
   Dim n As Integer
   ReturnFlag = TRUE
   LCaseChar = 0
   UCaseChar = 0
   NumChar = 0

   For n = 1 to Len(InString)
      NextChar = Mid(InString, n, 1)
      If NextChar > = 'a' And NextChar < = 'z' Then
         LCaseChar = LCaseChar + 1
      Else
         If NextChar > = 'A' And NextChar < = 'Z' Then
            UCaseChar = UCaseChar + 1
         Else
            If NextChar > = '0' And NextChar < = '9' Then
               NumChar = NumChar + 1
            Else
               ReturnFlag = False    //invalid character
            End If
         End If
      End If
   Next

   If NOT (LCaseChar > = 2 And UCaseChar > = 2 And NumChar > = 3)Then
      ReturnFlag = FALSE
   End If

   Return(ReturnFlag)

End Function
```

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Q6 (a): Pascal

```
Function ValidatePassword(InString : String): Boolean;
   Var LCaseChar, UCaseChar, NumChar : Integer;
   Var NextChar : Char;
   Var ReturnFlag : Boolean;
   Var n : Integer;

   begin
   ReturnFlag := TRUE;
   LCaseChar := 0;
   UCaseChar := 0;
   NumChar := 0;

   For n := 1 to Length(InString) do
      begin
         NextChar := Copy(InString,n,1);
         If NextChar > = 'a' And NextChar < = 'z' Then
            LCaseChar := LCaseChar + 1
         Else If NextChar > = 'A' AND NextChar < = 'Z' Then
                 UCaseChar := UCaseChar + 1
              Else If NextChar > = '0' AND NextChar < = '9' Then
                      NumChar := NumChar + 1
                   Else
                      ReturnFlag := False    //invalid character
      end

   If NOT(LCaseChar > = 2 And UCaseChar > = 2 And NumChar > =3)then
      ReturnFlag := False;


   ValidatePassword := ReturnFlag
   end;
```

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Q6 (a): Python

```
def ValidatePassword(InString):
   # lCaseChar, uCaseChar, numChar : INTEGER
   # nextChar : CHAR
   # returnFlag : BOOLEAN
   # n : INTEGER
   returnFlag = TRUE
   lCaseChar = 0
   uCaseChar = 0
   numChar = 0

   for n in range (0, Len(InString))
      nextChar = InString[n]
      If nextChar > = 'a' and nextChar < = 'z':
         lCaseChar = lCaseChar + 1
      ELSE:
         IF nextChar > = 'A' and nextChar < = 'Z':
            uCaseChar = uCaseChar + 1
         ELSE:
            IF nextChar > = '0' and nextChar < = '9':
               numChar = numChar + 1
            ELSE:
               returnFlag = False    //invalid character

   IF Not (lCaseChar > = 2 and uCaseChar > = 2 and numChar > = 3):
      returnFlag = FALSE

   Return (returnFlag)

#next code block
```

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