
COMPUTER SCIENCE

9608/21

Paper 2

May/June 2017

MARK SCHEME

Maximum Mark: 75

Published

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This document consists of **13** printed pages.

Question	Answer	Marks								
1(a)	Input: - Enter data into the system // get / receive / read data - INPUT MyVar // READFILE MyFile, MyString Process: - Manipulate / change data in some way // perform a calculation / find a result - MyChar ← 'X' // MyNum ← MyNum + 1 Output: - Send data out from the system // display / print / transmit / show data - OUTPUT "Hello World" // WRITEFILE MyFile, MyString Mark as follows: 1 mark for each type (in bold) 1 mark for each description and pseudocode example	7								
1(b)(i)	Boolean	1								
1(b)(ii)	Logical / Boolean	1								
1(b)(iii)	<table><tr><th>Expression</th><th>Evaluates to</th></tr><tr><td>FlagA AND (FlagB OR FlagC)</td><td>TRUE</td></tr><tr><td>FlagA AND (FlagB AND FlagC)</td><td>FALSE</td></tr><tr><td>(NOT FlagA) OR (NOT FlagC)</td><td>FALSE</td></tr></table> 1 mark per answer	Expression	Evaluates to	FlagA AND (FlagB OR FlagC)	TRUE	FlagA AND (FlagB AND FlagC)	FALSE	(NOT FlagA) OR (NOT FlagC)	FALSE	3
Expression	Evaluates to									
FlagA AND (FlagB OR FlagC)	TRUE									
FlagA AND (FlagB AND FlagC)	FALSE									
(NOT FlagA) OR (NOT FlagC)	FALSE									
1(c)	MyCount ← 100 WHILE MyCount < 201 Output MyCount MyCount ← MyCount + 2 ENDWHILE 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	4								

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 <u>entered</u> UserIDFound True if user ID found in the <u>file</u> PasswordValid True if password entered matches password from <u>file</u> //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

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

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

Question	Answer	Marks
5	Pseudocode solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix. <pre> 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 </pre> 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

Question	Answer	Marks
6(a)	Pseudocode solution included here for development and clarification of mark scheme. Programming language solutions appear in the Appendix. <pre> 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 ENDIF ENDIF ENDFOR IF Not (LCaseChar>=2 AND UCaseChar>= 2 AND NumChar>= 3) THEN ReturnFlag ← FALSE ENDIF RETURN (ReturnFlag) ENDFUNCTION </pre> 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

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

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

```

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;
```

```
        End;
```

```
        Close(MyFile);
```

```
End.
```

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()
```

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
```

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
    end

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

    ValidatePassword := ReturnFlag
  end;
```

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
```