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**COMPUTER SCIENCE**

**9608/23**

Paper 2 Written Paper

**May/June 2016**

MARK SCHEME

Maximum Mark: 75

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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1 (a) (i)

[6]

| Item | Statement           | Selection | Iteration | Assignment |
|------|---------------------|-----------|-----------|------------|
| 1    | WHILE DegF > 37.5   |           | ✓         |            |
| 2    | MyName = "Gordon"   |           |           | ✓          |
| 3    | DegF = INT(DegF)    |           |           | ✓          |
| 4    | ENDIF               | ✓         |           |            |
| 5    | CASE OF MyFavourite | ✓         |           |            |
| 6    | UNTIL x = 5         |           | ✓         |            |

One mark per row  
Additional ticks in any row cancels that row

(ii)

[6]

| Item | Purpose of statement  |
|------|---|
| 1    | (Start of) loop – repeat while <u>DegF</u> greater than <u>37.5</u>           |
| 2    | Assign (string) <u>"Gordon"</u> to <u>MyName</u>                              |
| 3    | Assign <u>integer</u> value / whole number part of <u>DegF</u> to <u>DegF</u> |
| 4    | End of an IF statement / selection statement                                  |
| 5    | Head of CASE / selection statement based on variable <u>MyFavourite</u>       |
| 6    | End of REPEAT / post-condition <u>loop</u> : repeated until <u>x</u> equals 5 |

Exact wording not important  
Explanation must refer to variables or values used in code (except for row 4)

(iii)

[2]

| Expression                     | Result  |
|--------------------------------|---------|
| 'P' & MID(MyString, 13, 4)     | "Paint" |
| RIGHT(MID(MyString, 6, 10), 4) | "Main"  |

Must have correct case  
Quotation marks optional

2 (a)

[5]

| <b>Identifier</b>  | <b>Data Type</b>                              | <b>Description</b>   |
|--------------------|---|--|
| <b>Accelerator</b> | <b>INTEGER</b>                                | Accelerator position<br>Values: 0 to 100 in steps of 1<br><br>Meaning:<br>0 : none (not pressed)<br>100: maximum (fully pressed) |
| <b>EngineTemp</b>  | <b>REAL / FLOAT /<br/>SINGLE /<br/>DOUBLE</b> | Engine temperature in °C<br>(–50 to +150 correct to 1 decimal place)   |
| <b>NormalTemp</b>  | <b>INTEGER</b>                                | Normal engine temperature in °C<br>Whole number; typical value 90  |
| <b>Speed</b>       | <b>INTEGER</b>                                | Road speed of car (in km/hr)<br>Values: 0 to 200 in steps of 1   |
| <b>EngineStop</b>  | <b>BOOLEAN</b>                                | Value used to signal engine must be stopped<br><br>Possible values:<br>TRUE: stop engine<br>FALSE: run engine                    |

One mark per row  
Data types as shown

|        |  |          |       |
|--------|--|----------|-------|
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(b)

[6]

```
INPUT Accelerator
INPUT EngineTemp
INPUT NormalTemp
INPUT Speed
```

1

3

```
IF Accelerator = 0 AND EngineTemp >= NormalTemp AND Speed = 0
  THEN
    EngineStop ← TRUE
  ELSE
    EngineStop ← FALSE
ENDIF
OUTPUT "Engine Stopped"
```

2

4

5

6

Mark points as circled, descriptions as below:

- Four INPUT statements (correct names and sequence)
- Correct IF..THEN..ELSE..ENDIF including first condition (or equivalent nested IFs)
- Correct second and third conditions
- Correct THEN statement
- Correct ELSE statement
- Output indicating EngineStop  
(Following ENDIF or as two separate statements within THEN and ELSE)

3 (a)

[11]

```
FUNCTION Decrypt (Lookup : ARRAY, CipherChar : CHAR) RETURNS CHAR
  DECLARE Found : BOOLEAN
  DECLARE Index : INTEGER
  DECLARE OriginalChar : CHAR

  Index ← 1 //start with first element in the array //
  //assign the start index

  Found ← FALSE
  //now search for CipherChar in Lookup:
  WHILE Found = FALSE // Found <> TRUE // NOT Found
    // compare CipherChar with this array element:
    IF Lookup[Index] = CipherChar
      THEN
        Found ← TRUE // Set the flag
      ELSE
        Index ← Index + 1 //Move to next array element
    ENDIF
  ENDWHILE
  //dropped out of loop so must have found CipherChar:
  OriginalChar ← CHR(Index) // convert Index to original character
  RETURN OriginalChar

ENDFUNCTION
```

One mark for each part-statement (shown underlined and bold)

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(b) 'Pseudocode' solution included here for development and clarification of the mark scheme. Programming language example solutions appear in the Appendix. [6]

```

INPUT StartIndex
INPUT NumberToOutput } ①

FOR Index ← StartIndex to StartIndex + NumberToOutput - 1
    OriginalChar ← CHR(Index) ③
    CipherChar ← Lookup[Index] ④
    OUPUT ("Index " & Index & ": Character " & OriginalChar &
           " has substitute character " & CipherChar) ⑤ ⑥
ENDFOR

```

② {

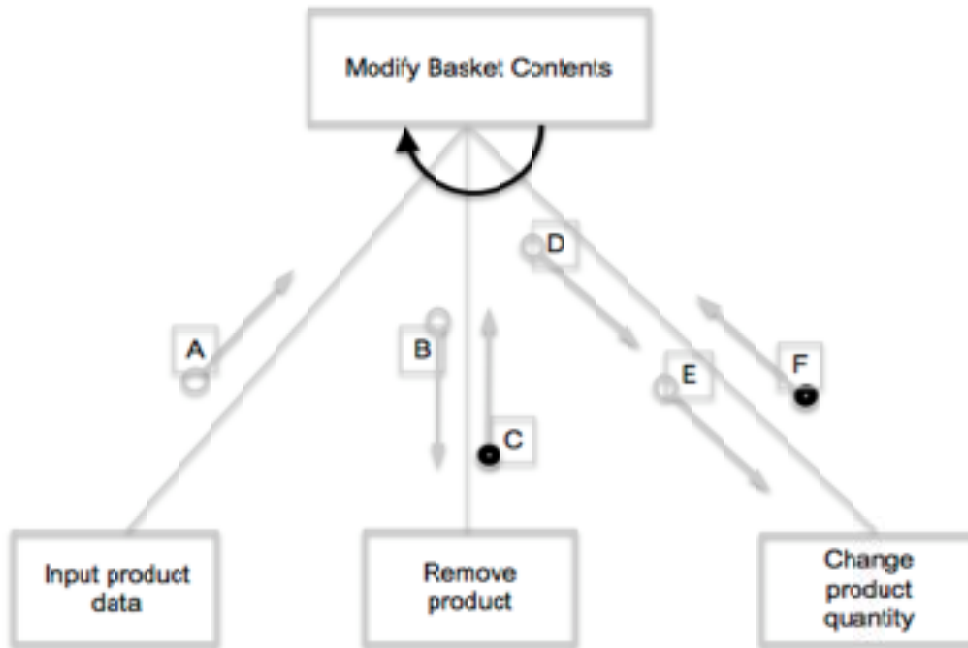
Mark points as circled, descriptions as below:

1. Two INPUT statements
2. Working loop using Index (allow alternative solutions including separate loop counter)
3. Assignment (using correct values of Index or other variable)
4. Assignment (using correct values of Index or other variable)
5. One mark for OUTPUT of a string combining text and variables...
6. ...a second mark if OUTPUT string is completely correct

- 4 (a) • Functions / Procedures [2]  
• Ability to pass parameters between modules  
• Use of local / global variables

(b) (i)

[1]



One mark for correct arrow as shown – accept either direction

(ii)

[4]

| Data Item   | Parameter |   |   |     |     |   |
|---|-----------|---|---|-----|-----|---|
|   | A         | B | C | D   | E   | F |
| Product ID  | ✓         | ✓ |   | ✓   | (✓) |   |
| Quantity  |           |   |   | (✓) | ✓   |   |
| Flag Value – indicating operation success or fail |           |   | ✓ |     |     | ✓ |

Mark as follows:

Row 1: One mark for tick in A **AND** B, one mark for D **OR** E

Row 2: One mark for D **OR** E (must be opposite of Row 1)

Row 3: One mark for C **AND** F

|        |  |          |       |
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5 (a) (i) **Explanation:** [Max 3]

- Easier to separate the two strings // to retrieve / search for / edit (text relating to a CD)
- Obvious where `CDTitle` ends and `CDArtist` begins

**Drawback:**

- Takes up more / unnecessary space in the file
- If the string is bigger than 40 characters then data will be lost // string length is limited
- The additional spaces will need to be removed before strings can be used

One mark per bullet

(ii) **Problem:** File `mode = WRITE` / file is opened for writing // by explanation [3]

**Effect:** All existing file lines / contents / data will be overwritten / deleted / lost

**Solution:** `WRITE` should be changed to `APPEND` (allow meaningful example)

Allow first two mark points to be interchanged – read as one paragraph.

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- (b) 'Pseudocode' solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix. **[Max 10]**

```

PROCEDURE OutputLocationList ()

    DECLARE CDTitle : STRING
    DECLARE CDArtist : STRING
    DECLARE CDSearch : STRING
    DECLARE FileData : STRING
    DECLARE Total : INTEGER
    DECLARE FileData : STRING

    Total ← 0

    OPENFILE "MyMusic" FOR READ

    OUTPUT "Input Location"
    INPUT CDSearch

    WHILE NOT EOF("MyMusic")
        READFILE ("MyMusic", FileData
        IF RIGHT(FileData, 8) = CDSearch
        THEN
            CDTitle ← LEFT(FileData, 40)
            CDArtist ← MID(FileData(41, 40)
            OUPUT (CDTitle & " - " & CDArtist)
            Total ← Total + 1
        ENDIF
    ENDWHILE

    OUTPUT (Total & " CDs found"
    CLOSEFILE("MyMusic")

ENDPROCEDURE

```

One mark for each of the following:

- Procedure heading and ending
- Declaration AND initialisation of variable used as counter (Total above)
- Prompt and input of location to search for CDSearch (or other name)
- Open file for reading (Allow MyMusic or MyMusic.txt)
- Working conditional loop structure including test for EOF

The following points must be present inside a loop

- Read a line from the file (or read complete file in one e.g. as list)
- Isolate 8 chars representing location **and** compare with CDLocation
- Extract strings representing CDTitle and CDArtist
- Output CDTitle and CDArtist (separator optional) if correct location found
- Increment Total if correct location found

The following points must be present after a loop

- Output message including number of CDs found at location (Total)
- Close file



6 (a) (i)

[4]

| n | x   | Flag  | m | NewString |
|---|-----|-------|---|-----------|
| – |     | TRUE  | 7 | “”        |
| 1 | ‘B’ | FALSE |   | “B”       |
| 2 | ‘i’ |       |   | “Bi”      |
| 3 | ‘g’ |       |   | “Big”     |
| 4 | ‘▽’ | TRUE  |   | “Big▽”    |
| 5 | ‘B’ | FALSE |   | “Big▽B”   |
| 6 | ‘e’ |       |   | “Big▽Be”  |
| 7 | ‘n’ |       |   | “Big▽Ben” |

One mark per correct column (**columns 3 and 4 count as 1**)

- Arrows indicate required sequence (i.e. “B” can’t be in row before TRUE)
- Letter case must be as shown
- Ignore quotation symbol
- Allow “ ” or ▽ for space symbol

(ii) (To return a string where:)

[2]

- The first character of each word is capitalised / made upper case // by explanation
- The remaining characters (of each word) are made lower case

(b) (i) • The function operates normally // returns an ‘empty string’

[1]

(ii) Examples of suitable test strings:

[3]

- Strings with all capitals
- Strings with all lower case
- Strings with first letters of words already capitalised (i.e. in correct format)
- Strings in “reverse” format – i.e. first letters lower case, the rest upper case
- String with only one word
- Strings with multiple spaces
- Strings with numbers / symbols

One mark for each string example **plus** supporting explanation.

|         |  |          |       |
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### Appendix – Program Code Example Solutions

#### Q3 (b): VB.NET

```

Console.WriteLine("Enter start position")
startIndex = Console.ReadLine()
Console.WriteLine("Enter how many")
NumberToOutput = Console.ReadLine()
For Index = startIndex To startIndex + NumberToOutput - 1
    OriginalChar = Chr(Index)
    CipherChar = Lookup(Index)
    Console.WriteLine("Index " & Index & ": Character " & OriginalChar &
        " has substitute character " & CipherChar)
Next Index

```

#### Q3 (b): Pascal

```

Writeln('Enter start position');
Readln(startIndex);
Writeln('Enter how many');
Readln(NumberToOutput);
For index := startIndex To startIndex + NumberToOutput - 1 Do
Begin
    OriginalChar := chr(index);
    CipherChar := Lookup[index];
    writeln("Index " + index + ": Character " + OriginalChar +
        " has substitute character " & CipherChar);
end;

```

#### Q3 (b): Python

```

startIndex = int(input("enter start position"))
numberToOutput = int(input("enter how many"))
for index in range(startIndex, (startIndex + numberToOutput)) :
    OriginalChar = chr(index)
    CipherChar = Lookup[index]
    print("Index " + (index) + ": Character " + OriginalChar +
        " has subst char " + CipherChar)

```

|         |  |          |       |
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### Q5 (b): VB.NET

#### A StreamReader() solution:

```

Sub OutPutLocationList()

    Dim Total As Integer
    Dim FileData As String
    Dim ObjReader As IO.StreamReader
    ObjReader = New IO.StreamReader("C:\MyMusic.txt")
    Dim CDLocation As String
    Dim CDTitle As String
    Dim CDArtist As String

    Total = 0
    Console.WriteLine("Input location to search ")
    CDSearch = Console.ReadLine
    Do While ObjReader.Peek <> -1
        FileData = ObjReader.ReadLine()
        If Right(FileData, 8) = CDLocation Then
            CDTitle = Left(FileData, 40)
            CDArtist = Mid(FileData, 41, 40)
            Console.WriteLine(CDTitle & " " & CDArtist)
            Total = Total + 1
        End If
    Loop
    Console.WriteLine(Total & " CDs were found")
    ObjReader.Close()
End Sub

```

#### A legacy FileOpen() solution:

```

Sub OutPutLocationList()

    Dim Total As Integer
    Dim FileData As String
    FileOpen (1, "C:\MyMusic.txt", OpenMode.Input)
    Dim CDLocation As String
    Dim CDTitle As String
    Dim CDArtist As String

    Total = 0
    Console.WriteLine("Input location to search ")
    CDSearch = Console.ReadLine
    Do While NOT EOF(1)
        Input(1, FileData)
        If Right(FileData, 8) = CDSearch Then
            CDTitle = Left(FileData, 40)
            CDArtist = Mid(FileData, 41, 40)
            Console.WriteLine(CDTitle & " " & CDArtist)
            Total = Total + 1
        End If
    Loop
    Console.WriteLine(Total & " CDs were found")
    FileClose(1)
End Sub

```

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### Q5 (b): Pascal

```

procedure OutputLocationList;
var
  FileData, CDLocation, CDTitle, CDArtist : String;
  CDFile : Textfile;
  Total : Integer;
Begin
  Total := 0;
  Writeln('Input location to search ');
  Readln(CDSearch);
  AssignFile(CDFile, 'MyMusic.txt');
  Reset(CDFile);

  While not eof(CDFile) Do
  Begin
    readln(CDFile, FileData);
    If copy(FileData, 80, 8) = CDSearch Then
    Begin
      CDTitle := copy(FileData, 1, 40);
      CDArtist := copy(FileData, 41, 40);
      Writeln(CDTitle + ' : ' + CDArtist);
      Total := Total + 1;
    End;
  End;

  Writeln(Total + ' CDs were found');
  CloseFile(CDFile);

End

```

### Q5 (b): Python

```

#total : Integer
#CDSearch, LineOfText, LineString : String

Def OutPutLocationList():
  FileHandle = open("MyMusicPy.TXT", "r")
  total = 0
  CDSearch = input("Enter location to search")
  LineOfText = FileHandle.readline()
  while len(LineOfText) > 0:
    LineString = LineOfText[80:87] #extract last 8 characters
    (location)
    if LineString == CDSearch:
      total = total+1
      CDTitle = LineOfText[0:39] #extract CD title
      CDArtist = LineOfText[40:79] #extract CD artist
      print(CDTitle + ": " + CDArtist)
      LineOfText = FileHandle.readline() #read next line
  print("There are " + str(total) + " in that location")
  FileHandle.close()

```