PAKISTAN

National Identity Card

ISLAMIC REPUBLIC OF PAKISTAN

Name
Mubashir Asif

مبشر آصف

Father Name
Muhammad Asif Memon

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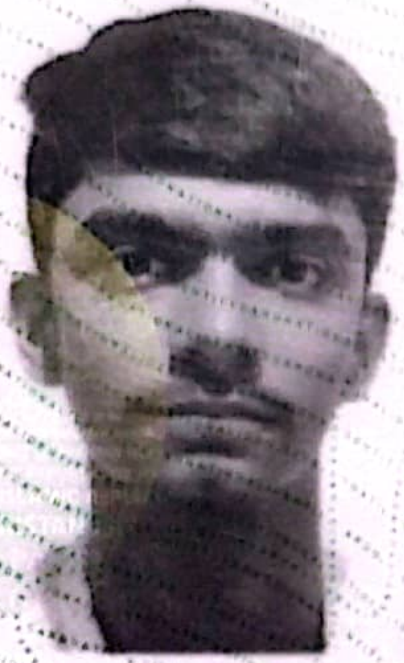

Gender
M

Country of Stay
Pakistan

Identity Number
42201-6127808-3

Date of Birth
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Date of Expiry
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Holder`s Signature

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Candidate Details Complete

Candidate Name:	**MUBASHIR ASIF**		
Candidate Number:	**0109**	Date of Birth:	**23 Jun 2006**
Status (School or Private):	**School**	Gender:	**Male**
National ID:	**422201-6127808-3**	English first language?:	**Not specified**
UCI:		Previous Centre Number:	
		Previous Candidate Number:	

Entries

Qualification	Code / Option	Syllabus and Component	Exam Date	Time	Status
GCE AS & A Level	9618 / SY	Computer Science			Complete
		12 Theory Fundamentals 12	08 May 2024	PM	
		22 Problem Solving & Programming 22	17 May 2024	PM	
GCE AS & A Level	9702 / S3	Physics			Complete
		12 Multiple Choice 12	06 Jun 2024	AM	
		22 AS Level Structured Questions 22	16 May 2024	AM	
		33 Advanced Practical Skills 33	30 Apr 2024	AM	
GCE AS & A Level	9709 / S6	Mathematics			Complete
		12 Pure Mathematics 1 (12)	02 May 2024	PM	
		52 Probability & Statistics 1 (52)	13 May 2024	PM	

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Question No. 1

Question	Answer	Marks
7(a)		7

```
FUNCTION GetStart (WordNum : INTEGER) RETURNS INTEGER
  DECLARE Index, ThisPos, NumFound : INTEGER
  DECLARE ThisChar : Char

  CONSTANT SPACECHAR = ' '

  Index ← -1
  Numfound ← 0
  ThisPos ← 1

  IF WordNum = 1 THEN  // if looking for word 1...
     Index ← 1         // Word 1 always starts at index
                       // position 1
  ELSE
                        // Otherwise start counting spaces...
     WHILE ThisPos <= LENGTH(FNString) AND Index = -1
        ThisChar ← MID(FNString, ThisPos, 1)
        IF ThisChar = SPACECHAR THEN
           NumFound ← NumFound + 1
           IF NumFound = WordNum - 1 THEN
              Index ← ThisPos + 1 // the start of the
                                  // required word
           ENDIF
        ENDIF
        ThisPos ← ThisPos + 1
     ENDWHILE
  ENDIF
RETURN Index

ENDFUNCTION
```

1 mark for each of the following:

1 Function heading, including return type and function end
2 Loop counting spaces until word found or end of `FNString`
3 extract a character from `FNString` **in a loop**
4 compare with `SPACECHAR` **and** increment count if equal **in a loop**
5 compare count with `WordNum - 1` (depending on initialisation value) **in a loop**
6 if equal then set flag or `Index` to `ThisPos + 1` **in a loop**
7 Return Index (correctly in all cases / following a reasonable attempt)
8 Works for special case when looking for word 1

Note: Max 7 marks

Question	Answer	Marks
7(b)	Marks awarded for any reference to each of the following steps of the algorithm: 1 Mention of variable for use as array index 2 Use of a loop (to check through the array) 3 If word is the same as the current array element then return `FALSE` / set flag 4 If word not already in array, loop to find unused element *(second loop)* 5 Store word in unused element and return `TRUE`, otherwise return `FALSE` VARIATION: 1 Mention of variable for use as array index 2 Use of a loop (to check through the array) 3 Save index of (first) unused element found 4 If word is the same as the current array element then return `FALSE` / set flag 5 If word not already in array **and** unused element available, store word in unused element and return `TRUE` otherwise return `FALSE` **Note: Max 4 marks**	4

7(c)	`FUNCTION GetWord (Index : INTEGER) RETURNS STRING`
	
	`  DECLARE NextWord : STRING`
	`  DECLARE Done : BOOLEAN`
	`  DECLARE ThisChar : CHAR`
	`  DECLARE Index : INTEGER`
	
	`  CONSTANT SPACECHAR = ' '`
	
	`  NextWord ← ""`
	`  Done ← FALSE`
	
	`  REPEAT`
	`  ThisChar ← MID(FNString, Index, 1)`
	`  IF ThisChar <> SPACECHAR THEN`
	`  NextWord ← NextWord & ThisChar // build up NextWord`
	`  ENDIF`
	`  IF ThisChar = SPACECHAR OR Index = LENGTH(FNString) THEN`
	`  Done ← TRUE`
	`  ENDIF`
	
	`  Index ← Index + 1`
	
	`  UNTIL Done = TRUE`
	
	`RETURN NextWord`
	
	`ENDFUNCTION`
	
	1 mark for each of the following:
	
	1 Conditional loop
	2 Extract char from `FNString` and compare with `SPACECHAR` **in a loop**
	3 Concatenate with `NextWord` if not `SPACECHAR` **in a loop**
	4 Exit loop when `SPACECHAR` encountered **or** when end of `FNString` reached
	5 Return `NextWord` (after reasonable attempt at forming, and must have been initialised)
		5

7(c)

The 'length and substring' solution:

```
FUNCTION GetWord (Index : INTEGER) RETURNS STRING
  DECLARE Done : BOOLEAN
  DECLARE ThisChar : CHAR
  DECLARE Index, NextPos : INTEGER

  CONSTANT SPACECHAR = ' '

  Done ← FALSE
  NextPos ← Index // must be at least one character in
                  // the required word

  REPEAT
     ThisChar ← MID(FNString, NextPos, 1)
     IF ThisChar = SPACECHAR OR NextPos =
                                LENGTH(FNString) THEN
        Done ← TRUE
     ELSE
        NextPos ← NextPos + 1
     ENDIF
  UNTIL Done = TRUE

  IF NextPos = LENGTH(FNString) THEN
     NextPos ← NextPos - 1  // special case when last word
  ENDIF

  RETURN MID(FNString, Index, NextPos - Index)

ENDFUNCTION
```

1 mark for each of the following:

1 Conditional loop
2 ...extract char from `FNString` and compare with `SPACECHAR` **in a loop**
3 .. increment count if word continues
4 Exit loop when `SPACECHAR` encountered **or** when end of `FNString` reached
5 Apply substring function and Return

Question No. 2

Question	Answer	Marks

8(a)	`FUNCTION IgnoreWord (ThisWord : STRING) RETURNS BOOLEAN`
	
	`  DECLARE Found : BOOLEAN`
	`  DECLARE Index : INTEGER`
	
	`  Found ← False`
	`  Index ← 1`
	`  ThisWord ← TO_LOWER(ThisWord)`
	
	`  REPEAT`
	`  IF TO_LOWER(IgnoreList[Index]) = ThisWord THEN`
	`  Found ← TRUE`
	`  ENDIF`
	`  Index ← Index + 1`
	`  UNTIL Found = TRUE OR Index > 10`
	
	`  RETURN Found`
	
	`ENDFUNCTION`
	
	1 mark for each of the following:
	
	1 Loop through array elements
	2 Convert both strings to same case
	3 Compare array element with parameter **in a loop**
	4 Set a flag (or similar) if match found (after reasonable attempt at MP3) **in a loop**
	5 Return `TRUE` or `FALSE` in all cases
	
	Note: Max 4 if function declaration incorrect
		5

Question	Answer	Marks
8(b)		8

```
Procedure GetInitials()

  DECLARE NewString, NextWord : STRING
  DECLARE ThisWordNum, Index : INTEGER

  ThisWordNum ← 0
  NewString ← ""

  REPEAT
    ThisWordNum ← ThisWordNum + 1
    Index ← GetStart(ThisWordNum)
    IF Index <> -1 THEN //if there is ThisWordNum
      NextWord  ← GetWord(Index)
      IF IgnoreWord(NextWord) = FALSE THEN
       NewString ← NewString & UCASE(LEFT(NextWord, 1))
      ENDIF
    ENDIF

  UNTIL Index = -1

  OUTPUT NewString

ENDPROCEDURE
```

1 mark for each of the following:

1 Declare `NewString` and initialise to empty string
2 Conditional loop to pick out **all** words from `FNString`
3 Evaluate result of `GetStart()` **in a loop**
4 Test result <> -1 and if not:
5 Assign result of `GetWord()` to a variable **in a loop**
6 Test result of `IgnoreWord()` **in a loop**
7 If not ignored, add the next initial letter to `NewString` **in a loop**
8 Increment `ThisWordNum` (must have been initialised) **in a loop**
9 Output `NewString` (must be all upper case) **outside loop**

Note: Max 8 marks

Question No. 3

Question	Answer	Marks

6(a)	`PROCEDURE SetRow(Row, SkipNum, SetNum : INTEGER)`
	`  DECLARE Col : INTEGER`
	
	`  // array is 1280 x 800`
	
	`  FOR Col ← SkipNum + 1 TO SkipNum + SetNum`
	`  Screen[Row, Col] ← 1`
	`  NEXT Index`
	
	`ENDPROCEDURE`
	
	ALTERNATIVE 1:
	
	`  FOR Col ← 1 TO SetNum`
	`  Screen[Row, SkipNum + Col] ← 1`
	`  NEXT Col`
	
	ALTERNATIVE 2:
	
	`  WHILE SetNum > 0`
	`  Screen[Row, SkipNum + SetNum] ← 1`
	`  SetNum ← SetNum - 1`
	`  ENDWHILE`
	
	Mark as follows:
	
	1 Procedure heading and ending including parameters
	2 Declaration of local Integer for `Col`
	3 Count-controlled loop with meaningful start number
	4 correct stop number
	5 Reference Screen Array element and set to 1 **in a loop**
		5

Question	Answer	Marks
6(b)		8

```
FUNCTION SearchInRow(ThisRow, StartCol : INTEGER) RETURNS
         INTEGER
   DECLARE ThisCol, Step : INTEGER
   DECLARE Found: BOOLEAN

   // array is 1280 x 800

   Found ← FALSE
   ThisCol ← StartCol

   // first decide which way to search
   IF StartCol = 1 THEN
      Step ← 1
      EndCol ← 1281
   ELSE
       Step ← -1
       EndCol ← 0
   ENDIF


   WHILE ThisCol <> EndCol AND Found = FALSE
      IF Screen[ThisRow, ThisCol] <> 1 THEN
         ThisCol ← ThisCol + Step
      ELSE
         Found ← TRUE
      ENDIF
   ENDWHILE

   IF Found = FALSE THEN
      ThisCol ← -1
   ENDIF

   RETURN ThisCol

ENDFUNCTION
```

Mark as follows:

1 Interpreting `StartCol` parameter to determine direction of search
2 An attempt at searching both up and down
3 Conditional Loop / Count-controlled loop with use of `ThisCol` index
4 Using correct values for `StartCol`, `EndCol` and `Step`
5 Reference a `Screen` element and compare with 1 **in a loop**
6 If equal save column or immediately Return column **in a loop**
7 Return column number or −1

Loop(s) terminate when element with value = 1 found

6(c)	``` FUNCTION GetCentreCol(ThisRow : INTEGER) RETURNS INTEGER DECLARE StartCol, EndCol, CentreCol : INTEGER StartCol ← SearchInRow(ThisRow, 1) IF StartCol = -1 THEN CentreCol ← StartCol ELSE EndCol ← SearchInRow(ThisRow, 1280) CentreCol ← INT((StartCol + EndCol)/2) ENDIF RETURN CentreCol ENDFUNCTION ``` Mark as follows: 1 Declaration of local `INTEGER` for return value 2 Use `SearchInRow()` with correct parameters and check for `-1` 3 Use `SearchInRow(ThisRow, 1)` and `SearchInRow(ThisRow, 1280)` 4 Calculate centre column 5 Use of `INT()` function // use of `DIV` 6 Return –1 or centre value **Max 5** marks if function heading, including return type, and ending is incorrect or incomplete	**6**

Question No. 4

Question	Answer	Marks

6(a)	`FUNCTION FirstRowSet() RETURNS INTEGER`
	`  DECLARE Row, Col : INTEGER`
	`  DECLARE Found : BOOLEAN`
	
	`  // array is 1280 x 800`
	`  Row ← 1`
	
	`  Found ← FALSE`
	`  WHILE Row <= 800 AND Found = FALSE // top to bottom`
	`  Col ← 1`
	`  WHILE Col <= 1280 AND Found = FALSE // left to right`
	`  IF Screen[Row,Col] = 1 THEN`
	`  Found ← TRUE // end function as soon as first`
	`  // found`
	`  ENDIF`
	`  Col ← Col + 1`
	`  ENDWHILE`
	`  Row ← Row + 1`
	`  ENDWHILE`
	
	`  IF Found = FALSE THEN  // nothing found`
	`  Row ← 0`
	`  ENDIF`
	`  RETURN Row - 1`
	`ENDFUNCTION`
	
	Mark as follows:
	
	1 Function heading and ending **and** return type
	2 (Conditional) outer loop 1 to 800 (row)
	3 (Conditional) inner loop 1 to 1280 // 1280 to 1 (column)
	4 Reference `Screen` element and test for = 1 // <> 0
	5 and if true save row number **and** exit loops
	6 Increment index variables in both inner **and** outer loop
	7 Return Row number or −1, following a reasonable attempt
		7

6(b)	One mark for: • (A flag is used to) exit the loops // iteration is terminated • as soon as a Screen element with value 1 is found	2

Question	Answer	Marks
6(c)(i)	One mark for: • Parameter(s) need to be passed to the module to identify the type of search • Search algorithm is controlled by (global) variables / parameters Alternative: • The search algorithms from the original modules are included in the new module • The new module needs to return / store the four values (the results of the four searches)	2
6(c)(ii)	One mark for advantage and one for disadvantage: Advantage: (max 1) • Only have to change one module if specification changes • Less repetitive code / fewer lines of code • Aids re-usability Disadvantage: (max 1) • Single module more complex / more error prone / more difficult to debug ... • Single module cannot be split among programmers / teams **Max 2**	2

6(d)	`PROCEDURE GetCentre ()`
	`  DECLARE StartRow, EndRow, StartCol, EndCol : INTEGER`
	
	`  StartRow ← FirstRowSet()`
	`  IF StartRow = -1 THEN`
	`  CentreRow ← -1 // no 'touch' detected`
	`  ELSE`
	`  EndRow ← LastRowSet()`
	`  StartCol ← FirstColSet()`
	`  EndCol ← LastColSet()`
	`  CentreRow ← INT((StartRow + EndRow)/2)`
	`  CentreCol ← INT((StartCol + EndCol)/2)`
	`  ENDIF`
	`ENDPROCEDURE`
	
	Mark as follows:
	
	1 Call <any `Set` function> and check for -1 // check for no element set
	2 ...and if so set `CentreRow` to –1
	3 Call all 4 `Set` functions to get 'extremity' values
	4 Calculate centre row and centre column
	5 Use of `INT()` function or `DIV` operator on values from MP4
	6 Assign calculated values to `CentreRow` and `CentreCol`
	
	Note:
	Max 5 if procedure heading and ending missing or incorrect (ignore array if passed as a parameter) **or** any local variables are undefined or of incorrect type
		6

Question No. 5

Question	Answer	Marks
8(a)	See code below	6

```
FUNCTION RandomChar() RETURNS CHAR
  DECLARE ThisRange : INTEGER
  DECLARE ThisChar : CHAR

  //First select the range
  ThisRange ← INT(RAND(3)) + 1 // 1 to 3

  CASE OF ThisRange
    1: ThisChar ← CHR(INT(RAND(26) + 65)) // 65 to 90:
                                          'A' to 'Z'
       ThisChar ← LCASE(ThisChar)       // 'a' to 'z'
    2: ThisChar ← CHR(INT(RAND(26) + 65)) // 65 to 90:
                                          A to Z
    3: ThisChar ← NUM_TO_STR(INT(RAND(10)) // '0' to '9'
  ENDCASE

  RETURN ThisChar
ENDFUNCTION
```

Mark as follows:

1 Generation of **any** integer random number
2 Randomly decide which of the three ranges to select
3 Selection structure based on range
4 One alphanumeric character range correct
5 All alphanumeric character ranges correct
6 Return `ThisChar`, following a reasonable attempt to generate a character in each range

8(b)	`FUNCTION FindPassword(Name: STRING) RETURNS STRING`
	`  DECLARE Index : INTEGER`
	`  DECLARE Password : STRING`
	
	`  Password ← ""`
	`  Index ← 1`
	
	`  WHILE Password = "" AND Index <= 500`
	`  IF Secret[Index, 1] = Name THEN`
	`  Password ← Decrypt(Secret[Index, 2])`
	`  ELSE`
	`  Index ← Index + 1`
	`  ENDIF`
	`  ENDWHILE`
	
	`  IF Password = "" THEN`
	`  OUTPUT "Domain name not found"`
	`  ENDIF`
	
	`  RETURN Password`
	
	`ENDFUNCTION`
	
	Mark as follows:
	
	1 Declare all local variables used, attempted solution has to be reasonable
	2 Conditional loop while not found and not end of array
	3 Compare value of element in column 1 with parameter passed into function
	4 ...and use Decrypt() with element in column 2 as parameter
	5 …use the return value of `Decrypt()`
	6 Output warning message if parameter not found
	7 Return `STRING` value
		7

8(c)	One mark for the name, one for the description Name: • Stub testing Description: • A simple module is written to replace each of the modules. • The simple module will return an expected value // will output a message to show they have been called	**3**
8(d)	Accept **one** example of a valid password to **Max 2** One mark for each password example that breaks **one** of the rules due to: • Length too long // length too short • Invalid character • Incorrect grouping (including number of hyphens) • Duplicated characters	**2**
8(e)	One mark for each part: • Generate a random integer divisible by 3 • Split range into 1/3 and set as numeric • Else alphabetic character	**3**

Question No. 6

Question	Answer	Marks
8(a)		5

```
FUNCTION Exists(ThisString : STRING, Search : CHAR)
                RETURNS BOOLEAN
   DECLARE Found : BOOLEAN
   DECLARE Index : INTEGER

   Found ← FALSE
   Index ← 1

   WHILE Found = FALSE AND Index <= LENGTH(ThisString)
      IF MID(ThisString, Index, 1) = Search THEN
         Found ← TRUE
      ELSE
         Index ← Index + 1
      ENDIF
   ENDWHILE

   RETURN Found

ENDFUNCTION
```

Marks as follows (Conditional loop solution):

1 Conditional loop while character not found and not end of string
2 Extract a char **in a loop**
3 Compare with parameter **without** case conversion **in a loop**
4 If match found, set termination logic **in a loop**
5 Return `BOOLEAN` value

ALTERNATIVE (Using Count-controlled loop):

```
  FOR Index ← 1 TO LENGTH(ThisString)
     IF MID(ThisString, Index, 1) = Search THEN
        RETURN TRUE
     ENDIF
   NEXT Index
   RETURN FALSE
```

Marks as follows (Count-controlled loop variant):

1 Loop for length of `ThisString` (allow from 0 or 1)
2 Extract a char **in a loop**
3 Compare with parameter without case conversion **in a loop**
4 If match found, immediate RETURN of TRUE
5 Return `FALSE` after the loop // Return Boolean if no immediate RETURN

8(b) — **8**

```
PROCEDURE SearchDuplicates()
  DECLARE IndexA, IndexB : INTEGER
  DECLARE ThisPassword, ThisValue : STRING
  DECLARE Duplicates : BOOLEAN

  Duplicates ← FALSE
  IndexA ← 1

  WHILE Duplicates = FALSE AND IndexA < 500
     ThisValue ← Secret[IndexA, 2]
     IF ThisValue <> "" THEN
        ThisPassword ← Decrypt(ThisValue)
        FOR IndexB ← IndexA + 1 TO 500 //
           IF Secret[IndexB, 2] <> "" THEN
              IF Decrypt(Secret[IndexB, 2]) = ThisPassword
                 THEN
                 OUTPUT "Password for " & Secret[IndexA, 1] &
                        "also used for " & Secret[IndexB, 1]
                 Duplicates ← TRUE
              ENDIF
           ENDIF
        NEXT IndexB
     ENDIF
     IndexA ← IndexA + 1
  ENDWHILE

  IF Duplicates = FALSE THEN
     OUTPUT "No duplicate passwords found"
  ENDIF

ENDPROCEDURE
```

Marks as follows to **Max 8**:

1. (Any) conditional loop...
2. ... from 1 to 499 while (attempt at) no duplicate
3. Skip unused password
4. Use `Decrypt()` and assign return value to `ThisPassword`
5. Inner loop from outer loop index + 1 to 500 searching for duplicates
6. Compare `ThisPassword` with subsequent passwords (**after** use of `Decrypt()`)
7. If match found, set outer loop termination
8. and attempt an Output message giving duplicate
9. Output 'No duplicate passwords found' message if no duplicates found **after the loop**

8(c) — **6**

One mark for each point that is referenced:

1 Initialise password to empty string at the start **and** return (attempted) password at the end of the function
2 Two loops to generate 3 groups of 4 characters // One loop to generate 12 / 14 characters
3 Use of `RandomChar()` to generate a character **in a loop**
4 Reject character if `Exists()` returns `TRUE`, otherwise form string **in a loop**
5 (Attempt to) use hyphens to link three groups
6 Three groups of four characters generated correctly with hyphens and without duplication (completely working algorithm)

Question No. 7

Question	Answer	Marks
9(a)	See below	7

```
FUNCTION Generate() RETURNS STRING
   DECLARE Password, Group : STRING
   DECLARE NextChar : CHAR
   DECLARE ACount, BCount : INTEGER
   CONSTANT HYPHEN = '-'

   Password ← ""

   FOR ACount ← 1 TO 3
      Group ← ""
      FOR BCount ← 1 TO 4
         REPEAT
            NextChar ← RandomChar()
         UNTIL Exists(Group, NextChar) = FALSE
         Group ← Group & NextChar
      NEXT BCount
      Password ← Password & Group & HYPHEN
   NEXT ACount
   Password ← LEFT(Password, 14)  // remove final hyphen
   RETURN Password
ENDFUNCTION
```

Marks as follows to **Max 7**:

1 Declaration **and** initialisation of `Password` as `STRING`
2 Outer loop for three groups / until password is complete // three group loops
3 Attempt to use of **both** `RandomChar()` **and** `Exists()` **in a loop**
4 (Inner) loop for 4 characters in a group // note every 4 chars **in a loop**
5 Conditional loop until char is unique
6 Concatenating unique character to `Group` **in a loop**
7 Concatenate `Group` / random character to `Password` **in a loop**
8 (Attempt to) insert hyphens between groups (or removing later) **and** Return `Password`

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(b)</td><td>

```
FUNCTION AddPassword(Name, Password : STRING)
         RETURNS BOOLEAN
   DECLARE Index : INTEGER
   DECLARE Added : BOOLEAN

   Added ← FALSE
   Index ← 1

   IF FindPassword(Name) = "" THEN // Domain name not in
                                   // array
      WHILE Added = FALSE AND Index <= 500
         IF Secret[Index, 1] = "" THEN
            Secret[Index, 1] ← Name
            Secret[Index, 2] ← Encrypt(Password)
            Added ← TRUE
         ELSE
            Index ← Index + 1
         ENDIF
      ENDWHILE
   ENDIF

   RETURN Added

ENDFUNCTION
```

Marks as follows:

1 Check that the website domain name isn't already in array using `FindPassword()` / linear search, otherwise:
2 (Conditional) loop while not added and not end of array
3 Check for unused element by testing value in column 1 **in a loop**
4 If unused, write parameter values to column 1 and 2 **and** set flag / variable
5 ...having used `Encrypt()` on the password
6 Return `BOOLEAN` value (correctly in all cases)

</td><td>6</td></tr>
<tr><td>9(c)</td><td>

One mark per point to **Max 3**.

Solution based on field length:

- Convert the length of the website domain name (either field) …
- … to a string of fixed length
- Form a string by concatenate this string with the other two (and write as one line of the file)

Solution based on use of separator character:

- Select a (separator) character that cannot occur in the domain name (e.g. space)
- Create a string from the domain name followed by the separator
- ...Concatenate the encrypted password (and write as one line of the file)

</td><td>3</td></tr>
</table>

Question No. 8

Question	Answer	Marks

8(a)	One mark for each point (**Max 7**) as follows:
	1 Function heading and ending **including** parameter and return type
	2 Declaration **and** initialisation of local Integer for `Count`
	3 OPEN in READ mode and CLOSE
	4 Conditional loop until `EOF()`
	5 Read a line **in a loop**
	6 If non-blank, increment count **in a loop**
	7 Terminate loop when 10 non-blank lines have been read
	8 Return Boolean in both cases
	
	`FUNCTION CheckFile(Thisfile : STRING) RETURNS BOOLEAN`
	`  DECLARE Valid : BOOLEAN`
	`  DECLARE ThisLine : STRING`
	`  DECLARE Count : INTEGER`
	
	`  Count ← 0`
	`  Valid ← FALSE`
	`  OPEN ThisFile FOR READ`
	
	`  WHILE NOT EOF(ThisFile) AND Valid = FALSE`
	`  READFILE ThisFile, ThisLine`
	`  IF ThisLine <> "" THEN`
	`  Count ← Count + 1`
	`  IF Count > 9 THEN`
	`  Valid ← TRUE`
	`  ENDIF`
	`  ENDIF`
	`  ENDWHILE`
	
	`  CLOSEFILE ThisFile`
	`  RETURN Valid`
	
	`ENDFUNCTION`
		7

8(b)	`CALL CountErrors("Jim01Prog.txt", 20)` One mark for each: 1 Module name, at least one parameter in brackets and one parameter correct 2 Completely correct statement	2

8(c)	Mark as follows:
	1 Procedure heading and ending **including** parameters
	2 Declaration and initialisation of local Integer value for `ErrCount`
	3 Use of `CheckFile()`, output message **and** terminate if it returns `FALSE`
	4 Conditional loop until `EOF()`
	5 ...or `ErrCount > MaxErrors`
	6 Read line and use as parameter to `CheckLine()` **in a loop**
	7 Test return value and increment `ErrCount` if non-zero **in a loop**
	8 Output either message once only as appropriate
	
	`PROCEDURE CountErrors(ThisFile : STRING, MaxErrors : INTEGER)`
	`  DECLARE ErrCount, ThisError : INTEGER`
	`  DECLARE ThisLine : STRING`
	
	`  ErrCount ← 0`
	
	`  IF CheckFile(ThisFile) = FALSE THEN`
	`  OUTPUT "That program file is not valid"`
	`  ELSE`
	`  OPEN ThisFile FOR READ`
	
	`  REPEAT`
	`  READFILE, ThisFile, ThisLine`
	`  ThisError ← CheckLine(ThisLine)`
	`  IF ThisError <> 0 THEN`
	`  ErrCount ← ErrCount + 1`
	`  ENDIF`
	`  UNTIL ErrCount > MaxErrors OR EOF(ThisFile)`
	
	`  IF EOF(ThisFile) = FALSE THEN`
	`  OUTPUT "Check terminated - too many errors"`
	`  ELSE`
	`  OUTPUT "There were ", ErrCount, " errors."`
	`  ENDIF`
	
	`  CLOSEFILE ThisFile`
	`  ENDIF`
	
	`ENDPROCEDURE`
		8

8(d)	One mark for each (**Max 2**): Examples: 1 Incorrect block structure. Missing keyword denoting part of block (for example `ENDPROCEDURE, ENDFUNCTION, ENDTYPE`) 2 Data type errors, for example, assigning an integer value to a string 3 Identifier used before it is declared 4 Incorrect parameter use	**2**

Question No. 9

Question	Answer	Marks

7(a)	One mark per point (**Max 6**):
	
	1 Procedure heading and ending **including** parameters
	2 Conditional loop containing incrementing `Index`...
	3 ...terminating when `ErrNum` found
	4 ...terminating when `ErrCode[Index] > ErrNum` (i.e. `ErrNum` not found)
	5 ... **OR** after element 500 tested
	6 Test if found and OUTPUT 'Found' message
	7 ...otherwise OUTPUT 'Not Found' message
	
	`PROCEDURE OutputError(LineNum, ErrNum : INTEGER)`
	`  DECLARE Index : INTEGER`
	
	`  Index ← 0`
	
	`  // Search until ErrNum found OR not present OR end of array`
	
	`  REPEAT`
	`  Index ← Index + 1`
	`  UNTIL ErrCode[Index] >= ErrNum OR Index = 500`
	
	`  IF ErrCode[Index] = ErrNum THEN`
	`  OUTPUT ErrText[Index], " on line ", LineNum //Found`
	`  ELSE`
	`  OUTPUT "Unknown error on line ", LineNum //Not found`
	`  ENDIF`
	
	`ENDPROCEURE`
		6

Question	Answer	Marks

7(b)	One mark per point (**Max 8**):
	
	1 Procedure heading and ending as shown
	2 Conditional loop correctly terminated
	3 An inner loop
	4 Correct range for inner loop
	5 Comparison (element J with J+1) **in a loop**
	6 Swap elements in **both** arrays **in a loop**
	7 'No-Swap' mechanism:
	• Conditional **outer** loop including flag reset
	• Flag set in **inner** loop to indicate swap
	8 Efficiency (this scenario): terminate inner loop when `ErrCode = 999`
	9 Reducing `Boundary` **in the outer loop**
	
	`PROCEDURE SortArrays()`
	`  DECLARE TempInt, J, Boundary : INTEGER`
	`  DECLARE TempStr : STRING`
	`  DECLARE NoSwaps : BOOLEAN`
	
	`  Boundary ← 499`
	
	`  REPEAT`
	`  NoSwaps ← TRUE`
	`  FOR J ← 1 TO Boundary`
	`  IF ErrCode[J]> ErrCode[J+1] THEN`
	`  //first swap ErrCode elements`
	`  TempInt ← ErrCode[J]`
	`  ErrCode[J] ← ErrCode[J+1]`
	`  ErrCode[J+1] ← TempInt`
	`  //now swap corresponding ErrText elements`
	`  TempStr ← ErrText[J]`
	`  ErrText[J] ← ErrText[J+1]`
	`  ErrText[J+1] ← TempStr`
	`  NoSwaps ← FALSE`
	`  ENDIF`
	`  NEXT J`
	`  Boundary ← Boundary - 1`
	`  UNTIL NoSwaps = TRUE`
	
	`ENDPROCEDURE`
		8

7(c)(i)	`ErrCode` **should be an** `INTEGER` // `ErrCode` **should not be a** `STRING`	**1**
7(c)(ii)	Benefits include: 1 Array of records can store mixed data types / multiple data types under a single identifer 2 Tighter / closer association between `ErrCode` and `ErrText` // simpler code as fields may be referenced together // values cannot get out of step as with two arrays 3 Program easier to design / write / debug / test / maintain / understand One mark per point **Note: Max 2 marks**	**2**
7(c)(iii)	`DECLARE Error : ARRAY[1:500] OF ErrorRec`	**1**

Question No. 10

Question	Answer	Marks
7(a)	One mark per point (**Max 8**):	8

1 Declaration and initialisation of local integer for `Count`
2 Appropriate prompt and two inputs
3 (Conditional) loop while error number input is in range // error code 999 reached
4 …and not end of array
5 Check if this `ErrCode` needs to be output **in a loop**
6 if so check for blank error text **in a loop**
7 Output in both cases
8 ….and increment count **in a loop**
9 OUTPUT of header and summary including count

```
PROCEDURE OutputRange()
  DECLARE First, Last, Count, Index, ThisErr : INTEGER
  DECLARE ThisMess : STRING
  DECLARE PastLast: BOOLEAN

  Count ← 0
  Index ← 1
  PastLast ← FALSE

  OUTPUT "Please input first error number: "
  INPUT First
  OUTPUT "Please input last error number: "
  INPUT Last

  OUTPUT "List of error numbers from ", First, " to ",
Last

  WHILE Index < 501 AND NOT PastLast
     ThisErr ← ErrCode[Index]
     IF ThisErr > Last THEN
        PastLast ← TRUE
     ELSE
        IF ThisErr >= First THEN
           ThisMess ← ErrText[Index]
           IF ThisMess =  "" THEN
              ThisMess ← "Error Text Missing"
           ENDIF
           OUTPUT ThisErr, " : ", ThisMess
           Count ← Count + 1
        ENDIF
     ENDIF
     Index ← Index + 1
   ENDWHILE

  OUTPUT Count, " error numbers output"

ENDPROCEDURE
```

7(b)(i)	One mark per point:
	
	1 (Conditional) loop terminating when item added **OR** end of array reached
	2 Test for unused element **in a loop**
	3 Assignment of values to arrays // save index of first blank location and assign after loop
	4 Set loop termination if empty element found in a loop
	5 Call `SortArrays()` **once**
	6 Calculation of remaining unused elements **and** return Integer value (for both cases)
	
	`FUNCTION AddError(ErrNum : INTEGER, ErrMess : STRING)`
	`RETURNS INTEGER`
	`  DECLARE Index, Remaining : INTEGER`
	`  CONSTANT Unused = 999`
	
	`  Index ← 1`
	`  Remaining ← -1`
	
	`  REPEAT`
	`  IF ErrCode[Index] = Unused THEN`
	`  ErrCode[Index] ← ErrNum`
	`  ErrText[Index] ← ErrMess`
	`  CALL SortArrays()`
	`  Remaining ← 500 - Index`
	`  ENDIF`
	`  Index ← Index + 1`
	`  UNTIL Remaining <> -1 OR Index > 500`
	
	`  RETURN Remaining`
	
	`ENDFUNCTION`
		6

7(b)(ii)	One mark per point (**Max 3**): 1. Loop through 500 elements (while error number not found) 2. Compare `ErrCode` for current element with the error number 3. If same, set element value to 999 (and terminate loop) 4. ... and call `SortArrays()` (to move 999 to the end) – once only	**3**