

9608\_s16\_qp\_21

**4 (a)** Structured programming involves the breaking down of a problem into modules. Give **two** reasons why this is done.

- 1 .....
- .....
- 2 .....
- .....

[2]

9608\_s17\_qp\_21

**4 (a)** A structure chart is a tool used in modular program design. State **three** pieces of information that a structure chart can convey about a program design.

- 1 .....
- .....
- 2 .....
- .....
- 3 .....
- .....

[3]

9608\_s17\_qp\_22

**4 (a)** High-level programming languages have many features that support the modular approach. One such feature is the use of parameters. State **two** other features.

- 1 .....
- .....
- 2 .....
- .....

[2]

9608\_s18\_qp\_21

**4 (a)** A structure chart is used in modular program design. Iteration and selection are two features of an algorithm that may be shown on a structure chart. Give **three** other features.

- Feature 1 .....
- .....
- Feature 2 .....
- .....
- Feature 3 .....
- .....

.....[3]

9618/02/SP/21

**5** A company keeps details of its product items in a 1D array, Stock. The array consists of 1000 elements of type StockItem.  
The record fields of StockItem are:

Field	Typical value
ProductCode	"BGR24-C"
Price	102.76
NumberInStock	15

**(a)** Write pseudocode to declare the record structure StockItem.

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 .....  
 .....  
 ..... [3]

**(b)** Write pseudocode to declare the Stock array.

..... [3]

**(c)** Write pseudocode to modify the values to element 20 as follows:

- set the price to 105.99
- increase the number in stock by 12

.....  
 .....  
 ..... [2]

**(d)** A stock report program is developed.  
Write pseudocode to output the information for each stock item that has a price of at least 100. Output the information as follows:  
Product Code: BGR24-C Number in Stock: 15

.....

[4]

9618/02/SP/21

**6** Members of a family use the same laptop computer. Each family member has their own password.

To be valid, a password must comply with the following rules:

- 1 At least two lower-case alphabetic characters
- 2 At least two upper-case alphabetic characters
- 3 At least three numeric characters
- 4 Alpha-numeric characters only

A function, `ValidatePassword`, is needed to check that a given password follows these rules.

This function takes a string, `Pass`, as a parameter and returns a boolean value:

- TRUE if it is a valid password
- FALSE otherwise

**(a)** Write pseudocode to implement the function `ValidatePassword`.

Refer to the **Insert** for the list of pseudocode functions and operators.



(ii) Password1 is modified to test each rule separately. Give **four** modified passwords and justify your choice.

Password to test rule 1: .....

Reason: .....

.....

.....

Password to test rule 2: .....

Reason: .....

.....

.....

Password to test rule 3: .....

Reason: .....

.....

.....

Password to test rule 4: .....

Reason: .....

.....

.....

[4]

(iii) When testing the ValidatePassword function a module it is necessary to test all possible paths through the code.

State the name given to this type of validation testing.

..... [1]

(iv) A program consisting of several functions can be tested using a process known as 'stub testing' Explain this process.

.....

.....

.....  
 ..... [2]

**7** LogArray is a 1D array containing 500 elements of type STRING.  
 A procedure, LogEvents, is required to add data from the array to the end of the existing text file LoginFile.txt Unused array elements are assigned the value "Empty". These can occur anywhere in the array and should **not** be added to the file.  
 Write pseudocode for the procedure LogEvents.  
 Refer to the **Insert** for the list of pseudocode functions and operators.

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[8]

9608/21/M/J/16

**1** The items in the table below are individual statements in a generic programming language.  
 For the built-in functions list, refer to the **Appendix** on page 18.  
**(a) (i)** Show what type of programming construct each statement represents.  
 Complete the table by putting a tick (✓) in the appropriate column for each item.

Item	Statement	Selection	Iteration	Assignment
1	MyScore = 65			
2	FOR IndexVal = 0 TO 99			
3	MyArray[3] = MID(MyString, 3, 2)			
4	IF MyScore >= 70 THEN			
5	ENDWHILE			
6	ELSE Message = "Error"			

[6]

(ii) State the purpose of each statement in the table in **part (a)(i)**.  
Do **not** use mathematical symbols in your descriptions.

Item	Purpose of statement
1	..... .....
2	..... .....
3	..... .....
4	..... .....
5	..... .....
6	..... .....

[6]

9608/21/M/J/16

**2** A team is designing a software system to monitor temperature in a process. To do this, the system needs to sample the temperature repeatedly. If the temperature exceeds a given threshold value, an alarm will sound.  
The system is to be software-based. It will include a subroutine, SampleTemp, which samples the temperature and sets the alarm state to either ON or OFF.  
The initial design stage will produce a prototype of SampleTemp with a user interface.





[6]

9608/21/M/J/16

**3** A string encryption function is needed. The encryption uses a simple character-substitution method.

In this method, a new character substitutes for each character in the original string. This will create the encrypted string.

The substitution uses the 7-bit ASCII value for each character. This value is used as an index for a 1D array, Lookup, which contains the substitute characters.

Lookup contains an entry for each of the ASCII characters. It may be assumed that the original string and the substitute characters are all printable.

For example:

- 'A' has ASCII value 65
- Array element with index 65 contains the character 'Y' (the substitute character)
- Therefore, 'Y' substitutes for 'A'
- There is a different substitute character for every ASCII value

The programmer writes a function, EncryptString, to return the encrypted string. This function will receive two parameters, the original, PlainText string and the 1D array.

**(a)** The first attempt at writing the pseudocode for this function is shown below. Complete the pseudocode.

For the built-in functions list, refer to the **Appendix** on page 18.

```

FUNCTION EncryptString( . . . . . ) RETURNS STRING
DECLARE . . . . . : CHAR
DECLARE OldCharValue : . . . . .
DECLARE n : INTEGER
DECLARE OutString : STRING
. . . . . //initialise the return string
//loop through PlainText to produce OutString
FOR n ← 1 TO . . . . . //from first to last character
OldChar ← . . . . . // get next character
OldCharValue ← . . . . . // find the ASCII value
NewChar ← . . . . . // look up substitute character
. . . . . // concatenate to OutString
ENDFOR
. . . . .
ENDFUNCTION

```

[10]

**(b)** Additional code needs to be written to allow the user to change some of the characters in the

array Lookup.

The user will input:

- the array start position
- the number of elements to change
- each new substitute character

At the end, the program will finally output a confirmation message.

The first version of the algorithm is represented by the flowchart on the following page.

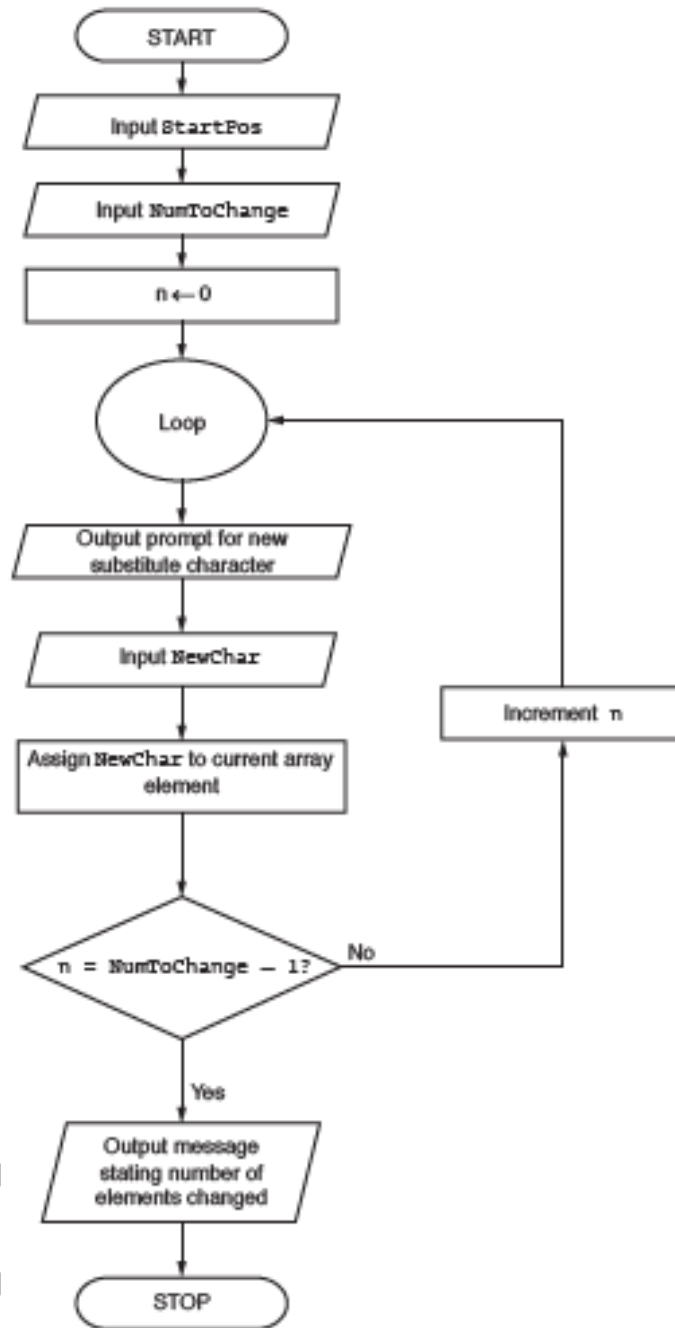
(i) Write **program code** to declare the array Lookup.

Programming language .....  
 .....  
 .....  
 ..... [2]

(ii) Write **program code** to implement the flowchart design.

In addition to the Lookup array, assume that the following variables have been declared:  
 StartPos, NumToChange, n, NewChar

Programming language .....  
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 .....  
 .....  
 ..... [6]



4 (a) Structured programming involves the breaking down of a problem into modules. Give **two** reasons why this is done.

- 1 .....
- 2 .....

[2]

(b) A team needs to write a program to implement an online shopping system. Customers will

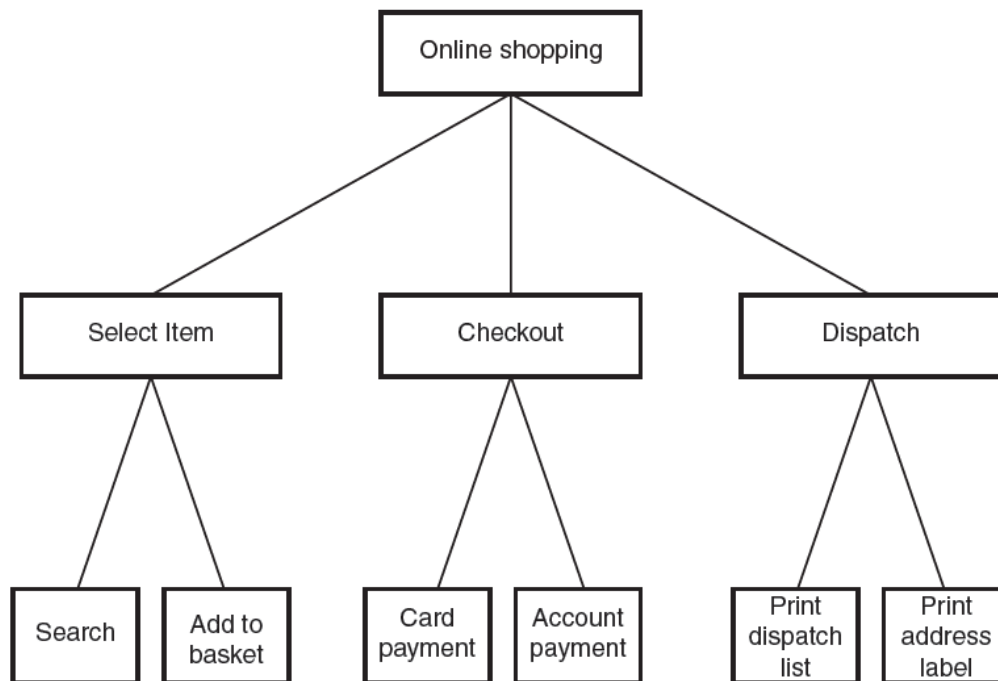
access the program via a website.

Customers can search for items before adding them to a virtual shopping basket. When they have finished shopping, they pay for the items. The program provides output for the dispatch of the items.

Some of the key features of the system are as follows:

- a customer can add many items to the shopping basket
  - payment may be either by credit or debit card, or by adding to a customer account
  - the shop may dispatch the items in one or more packages
- The structure chart below shows the program modules only.

(i) Draw on the chart, the symbols that represent the key features listed in **part (b)** above.



[3]