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COMPUTER SCIENCE

9618/02

Paper 2 Fundamental Problem-solving and Programming Skills

For examination from 2021

SPECIMEN PAPER

2 hours

You must answer on the question paper.

You will need: Insert (enclosed)

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use an HB pencil for any diagrams, graphs or rough working.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [].
- No marks will be awarded for using brand names of software packages or hardware.
- The insert contains all the resources referred to in the questions.

This document has **14** pages. Blank pages are indicated.

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

1 (a) Program variables have values as follows:

Variable	Value
Today	"Tuesday"
WeekNumber	37
Revision	'C'
MaxWeight	60.5
LastBatch	TRUE

(i) Give an appropriate data type for each variable.

Variable	Data type
Today	
WeekNumber	
Revision	
MaxWeight	
LastBatch	

[5]

(ii) Evaluate each expression in the following table.
If an expression is invalid then write ERROR.

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

Expression	Evaluates to
MID(Today, 3, 2) & Revision & "ape"	
INT(MaxWeight + 4.2)	
LENGTH(MaxWeight)	
MOD(WeekNumber, 12)	
(Revision <= 'D') AND (NOT LastBatch)	

[5]

(b) Simple algorithms usually consist of input, process and output.

Complete the table to show if each statement is an example of input, process or output. Place one or more ticks (✓) for each statement.

Item	Statement	Input	Process	Output
1	SomeChars ← "Hello World"			
2	OUTPUT RIGHT(SomeChars, 5)			
3	READFILE MyFile, MyChars			
4	WRITEFILE MyFile, "Data is " & MyChars			

[4]

(c) Write in pseudocode a **post-condition loop** to output all the odd numbers between 100 and 200.

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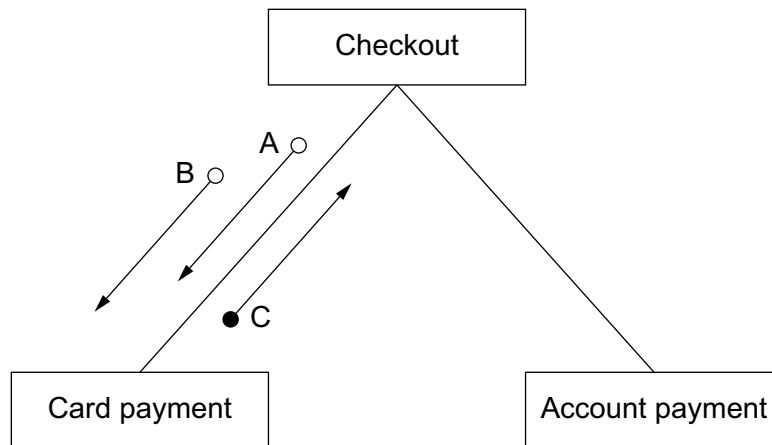
.....

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..... [4]

2 Roberta downloads music from an online music store. The diagram shows part of a structure chart for the online music store program.



(a) State **three** items of information that the diagram shows about the design of the program.

- 1
- 2
- 3

[3]

(b) Examples of the data items that correspond to the arrows are given in the table.

Arrow	Data item
A	234.56
B	"Ms Roberta Smith"
C	TRUE

Use pseudocode to write the function header for the Card payment module.

-
- [3]

- 3 A stack is created using a high-level language. The following diagram represents the current state of the stack. The `TopOfStack` pointer points to the last item added to the stack.

Address	Value	Pointer
99		
100		
101	E	← <code>TopOfStack</code>
102	D	
103	C	
104	B	
105	A	

- (a) Two operations associated with this stack are `PUSH()` and `POP()`.

Describe these operations with reference to the diagram.

`MyVar = POP()`

.....

.....

.....

`PUSH('Z')`

.....

.....

.....

[4]

- (b) Two programs use a stack to exchange data. Program `AddString` pushes a string of characters onto the stack one character at a time. Program `RemoveString` pops the same number of characters off the stack, one character at a time. The string taken off the stack is different from the string put on the stack.

Explain why the strings are different.

.....

.....

.....

[2]

4 (a) Parameter x is used to pass data to procedure `MyProc` in the following pseudocode:

```
x ← 4
CALL MyProc(x)
OUTPUT x
```



```
PROCEDURE MyProc(x : INTEGER)
  DECLARE z : INTEGER
  x ← x + 1
  z ← x + 3
ENDPROCEDURE
```

There are two parameter passing methods that could be used.

Complete the following table for each of the two methods.

Name of parameter passing method	Value output	Explanation
.....
.....

[6]

(b) The pseudocode includes the use of parameters.

State **two** other features in the pseudocode that support a modular approach to programming.

- 1
-
- 2
-

[2]

- 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
<code>ProductCode</code>	"BGR24-C"
<code>Price</code>	102.76
<code>NumberInStock</code>	15

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

.....

 [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

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..... [4]

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 Alphanumeric 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.

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(b) The `ValidatePassword` function will be tested.

- (i) Give a valid password that can be used to check that the function returns TRUE under the correct conditions.

Password1: [1]

- (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 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.

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..... [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.

Dotted lines for writing pseudocode, ending with a [8] mark.

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