



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
 General Certificate of Education
 Advanced Subsidiary Level and Advanced Level

CANDIDATE
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COMPUTING

9691/23

Paper 2

October/November 2013

2 hours

Candidates answer on the Question Paper.

No additional materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **16** printed pages and **4** blank pages.



1 The Science Department has a problem keeping track of its equipment. Ashvin has been asked to design and program a solution as his Computing Project.

(a) Ashvin has little programming experience, but has to write code for this program. He starts by writing some pseudocode.

For each statement, describe what is wrong and write a correct version.

(i) `NoOfBalances + 1 ← NoOfBalances`

Description

.....

Correct statement

..... [2]

(ii) `IF NoOfPipettes > NoOfBeakers OR < NoOfBottles THEN OUTPUT "Check the numbers"`

Description

.....

Correct statement

..... [2]

(iii) Explain why it is considered bad practice to start a project by writing program code.

.....

..... [1]

(b) This project was the largest computing problem Ashvin had worked on.

His friends wrongly advised him to program a solution as a whole. He decided to break the problem into smaller parts.

State and justify **three** of the reasons Ashvin gave his friends for breaking the problem into smaller parts.

Reason 1

.....

.....

Reason 2

.....

.....

Reason 3

.....

..... [6]

For
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Ashvin decides the design will include the following modules:

- Update the equipment file when new equipment is bought.
 - Generate an equipment ID for an item of science equipment.
 - Input all the data about the piece of equipment.
- Update the equipment file when old equipment is discarded.

(c) (i) Describe how a structure diagram will help Ashvin.

.....

.....

.....

..... [2]

(ii) Draw a structure diagram for the above modules.

[2]

*For
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Use*

(d) Ashvin splits the first alternative module (Generate an equipment ID for an item of science equipment) into two smaller modules:

- Generate an equipment ID for an item of science equipment.
- Store the item record in the resource file.

Re-draw your diagram adding the two new modules.

[2]

(e) The module that stores all the equipment data needs to receive a data value produced in another module.

(i) What data value is this?

..... [1]

(ii) Explain how this is done.

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

2 (a) (i) Explain how individual letters are represented inside a computer system.

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

(ii) How does the computer system use this representation to put lower case letters into alphabetical order?

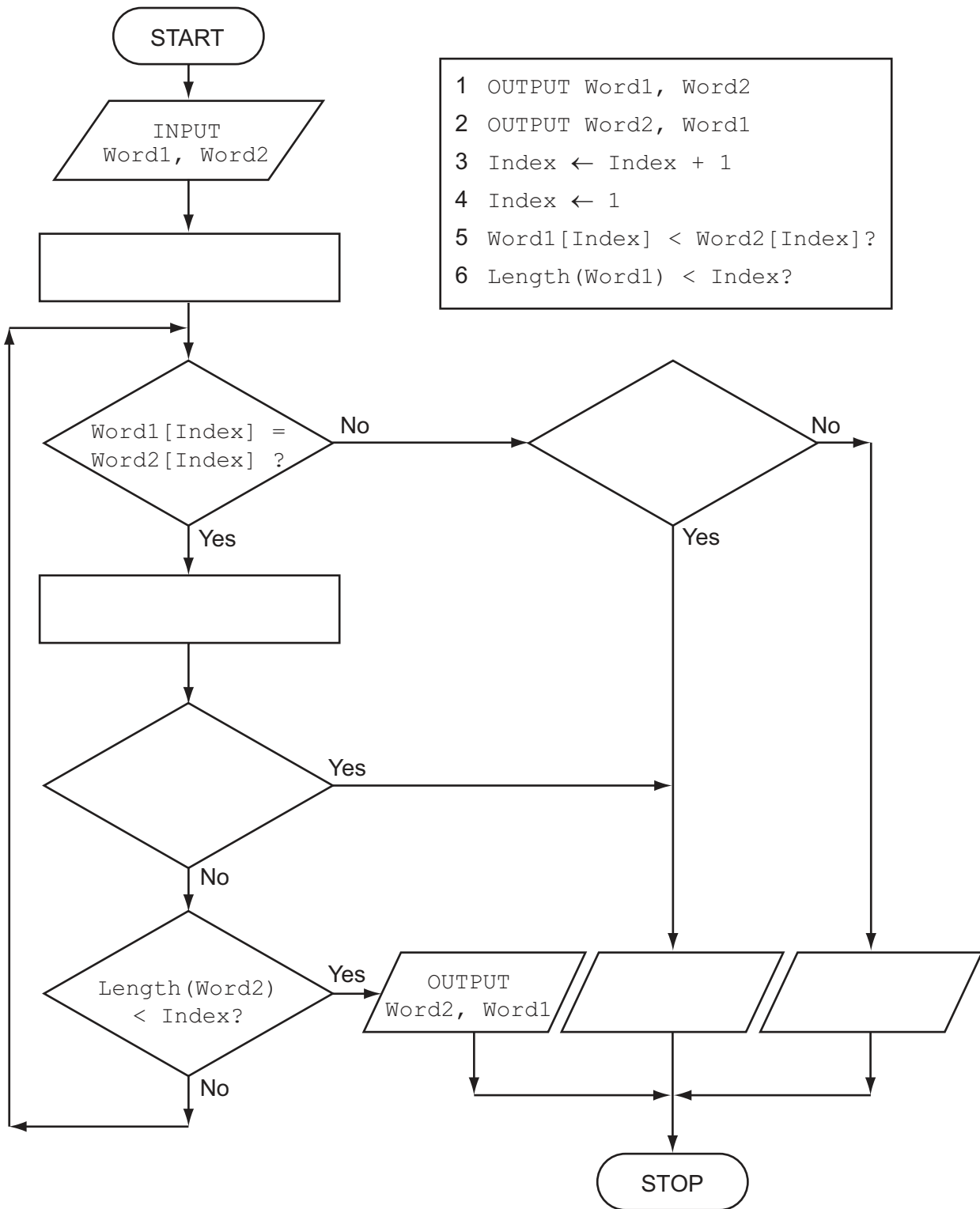
.....
..... [1]

(b) Part of Ashvin's program will involve comparing equipment names, such as "cable" and "capacitor".

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The flowchart outputs the two words in alphabetical order.

Complete the flowchart using the statements in the box below.



[6]

(c) Ashvin will use an array `Equipment` to hold equipment names.

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Use*

In a high-level programming language:

- declare the array of size 500
- initialise the array

Programming language

Code

.....

.....

.....

.....

..... [4]

- (e) In a high-level programming language write code that carries out the selections using a CASE/SELECT statement.

*For
Examiner's
Use*

Programming language

Code

.....

.....

.....

.....

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.....

[5]

Question 3 begins on page 12.

- 3 (a) An interface is to be designed to add a new piece of equipment.
The user will:

- enter the name of the equipment
- choose the science subject it will be used in
- if Chemistry, indicate if secure storage is necessary
- select the purchase date

The program generates and displays:

- a new equipment ID
- where the equipment is to be kept

The user must be able to save the data, clear/cancel the input, and move on to entering another piece of equipment.

Design a graphical user interface (GUI). Pay particular attention to layout and effective use of the controls you would expect to find in a GUI.

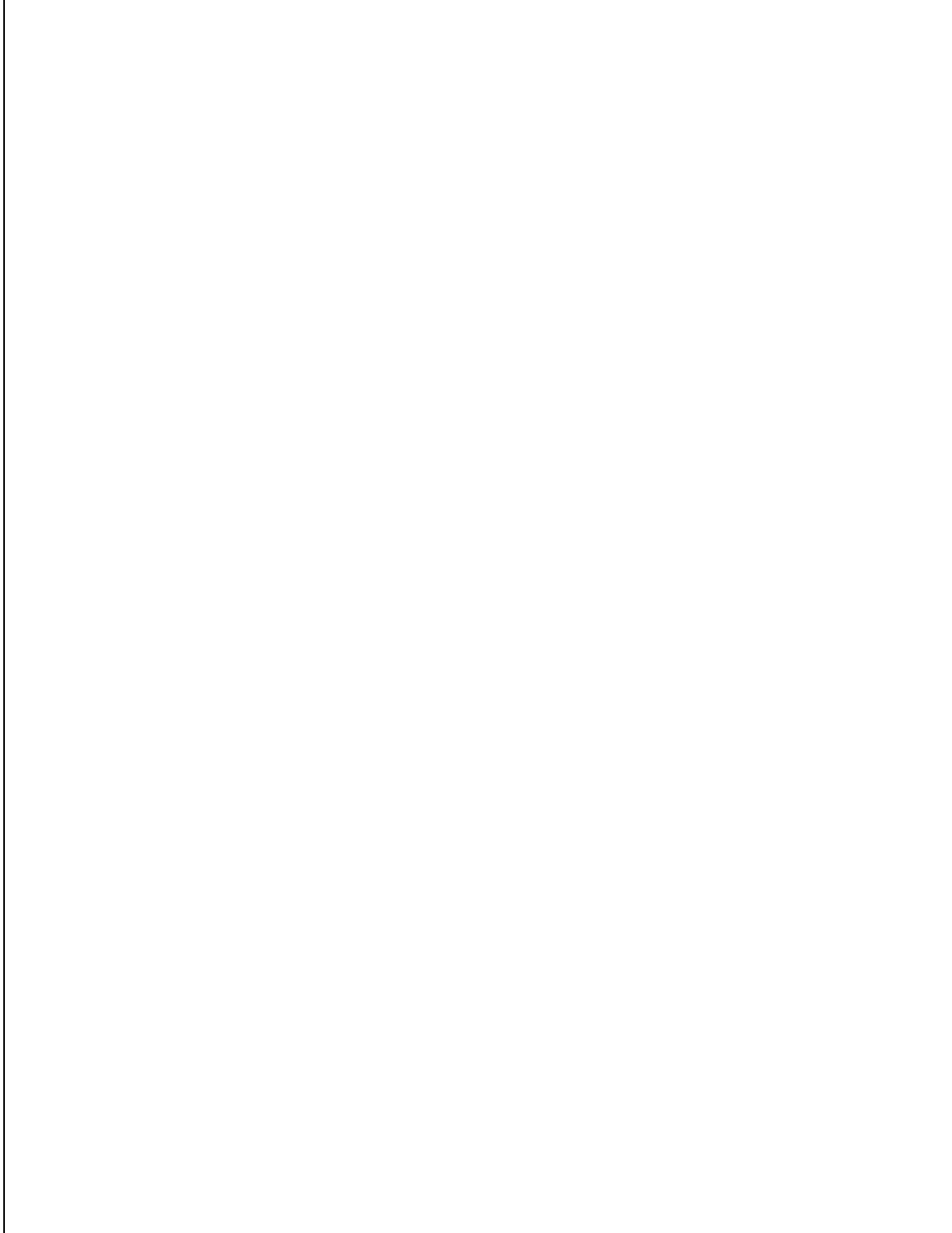
Add new equipment

[6]

(b) A report will show all the items that have been entered on a particular day.

It will show each equipment ID and where the equipment is kept. Equipment for the same science subject will be grouped together.

Design the report layout.

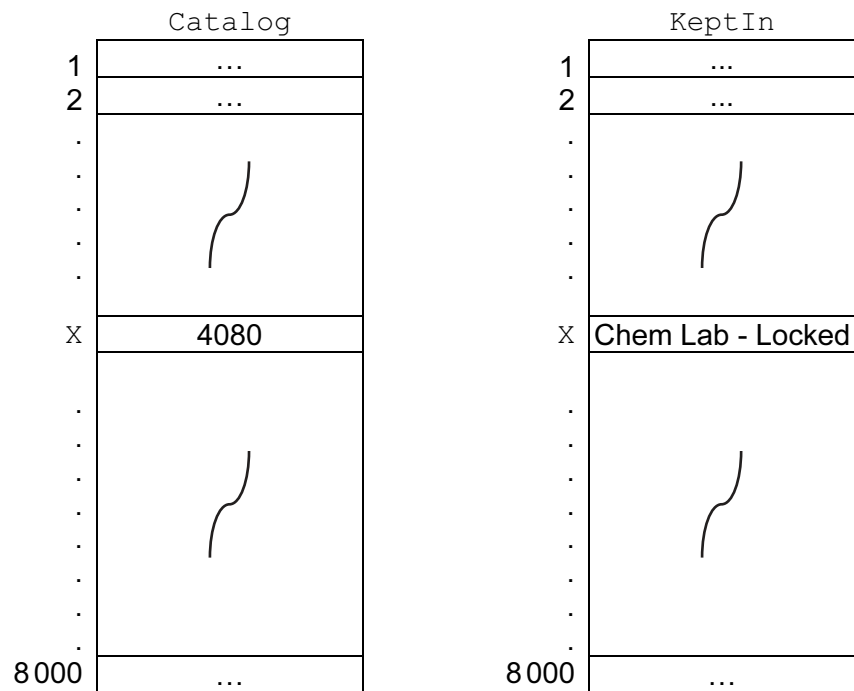


[5]

*For
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Use*

An array, `Catalog`, size 8000, data type `INTEGER`, is used to store the equipment IDs.
 An array, `KeptIn`, size 8000, data type `STRING`, is used to store where a piece of equipment is kept.
 A piece of equipment with equipment ID `Catalog[X]` is kept at `KeptIn[X]` where `X` is an integer variable.

For
 Examiner's
 Use



Ashvin writes the pseudocode that searches `Catalog` for a given equipment ID. The output is to be where the piece of equipment is kept.

```

flag ← 0
INPUT P
FOR X ← 1 TO 8000
  IF catalog[X] = P
  THEN
  OUTPUT keptin[X]
  flag ← 1
  ENDIF
NEXT
IF flag = 0
  THEN
  OUTPUT "Not Found"
  ENDIF

```

(c) Give **four** techniques that should have been applied to the pseudocode to make it easier to understand.

1

 2

 3

 4

 [4]

(d) Re-write the pseudocode using a REPEAT – UNTIL loop. Make use of the techniques you used in your answer to part (c).

.....

 [6]

(e) Ashvin will perform dry runs on the pseudocode using a trace table and a variety of test data. He hopes to find any logic errors and avoid run-time errors occurring later.

For
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Use

(i) State what is meant by a logic error and give an example.

Logic error

Example [2]

(ii) State what is meant by a run-time error and give an example.

Run-time error

Example [2]

4 Ashvin is also learning about recursion. He writes the pseudocode for a recursive function.

```
1  FUNCTION Calc(X)
2  DECLARE Temp
3      IF X > 0
4          THEN
5              Temp ← X + Calc(X - 2)
6          ELSE
7              Temp ← 0
8      ENDIF
9  RETURN Temp
10 ENDFUNCTION
```

(a) What is the scope of the variable Temp?

..... [1]

(b) State the line number which shows that this function is recursive.

..... [1]

(c) List the function calls that are generated by an initial call Calc(5).

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

(d) What will be returned by the call Calc(6)?

..... [1]

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