



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

CANDIDATE  
 NAME

CENTRE  
 NUMBER

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 NUMBER

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**COMPUTING**

**9691/22**

Paper 2

**October/November 2011**

**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 **12** printed pages.



1 Nathan is designing a software solution for stock control in a mobile phone shop. He has a colleague called Andre who will help him write the program. Nathan decides to modularise the solution.

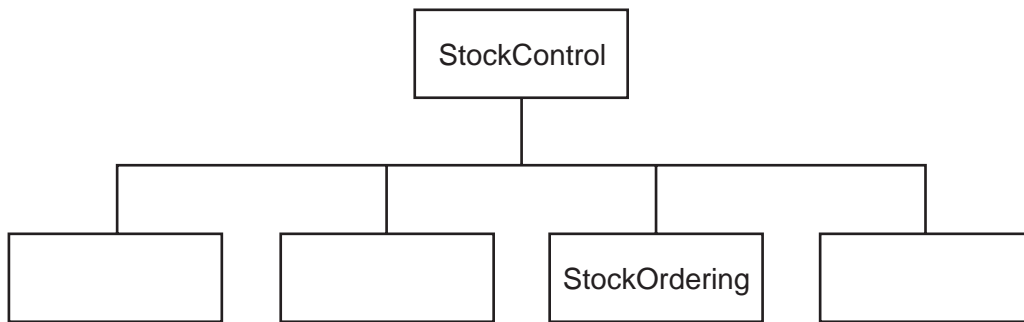
(a) State why modularisation is a good idea.

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

(b) As the first step in his design he splits the solution into the following main areas:

Initialisation, PhoneSales, StockOrdering, Accounts.

Complete the following structure diagram.



[1]

(c) StockOrdering is made up of two modules, PlaceOrder and ReceiveGoods.

Add them to the structure diagram in (b).

[2]

(d) Nathan will write the PlaceOrder module and Andre will write the ReceiveGoods module. Nathan will use the identifier *OrderValue* for the value of an order placed. Andre will use the identifier *OrderValue* for the total value of the received goods.

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Explain how they can both use the same identifier and not cause a problem when the program is run.

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

(e) (i) Explain why there are some words that cannot be used as variable identifiers.

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

(ii) Give an example of an **invalid** identifier.

Language .....

Invalid identifier ..... [1]

(iii) Both programmers need to choose other identifiers that they use.

State **three** other rules of a high-level programming language that restrict the choice of identifiers.

Language .....

Rule 1 .....

.....

Rule 2 .....

.....

Rule 3 .....

..... [3]

(f) One line in the program reads

```
SalesTax = a – b * 0.1
```

(i) Work out the value of this expression when a is 600 and b is 200.

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

(ii) The programmer has made an error in the code. When a is 600 and b is 200 the expected answer is 40.

Rewrite the line of code with added parentheses to give the expected result.

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

(iii) Name the type of testing strategy which identified this error.

..... [1]

(g) One type of test data is invalid data.

(i) Name the other **two** types.

1 .....  
2 ..... [2]

(ii) Nathan has written the PhoneSales module, which now needs testing.

- ContractLength, the number of months of the contract, can be only 12, 18 or 24
- FreeTexts, the number of free text messages per month must be in the range 0 to 600

Give **six** different items of test data other than invalid data which thoroughly test the two rules given above. Give a reason for each choice.

ContractLength	FreeTexts	Reason
20		Invalid data for ContractLength
	1000	Invalid data for FreeTexts

[6]

(h) (i) Write a Boolean expression to validate ContractLength.

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

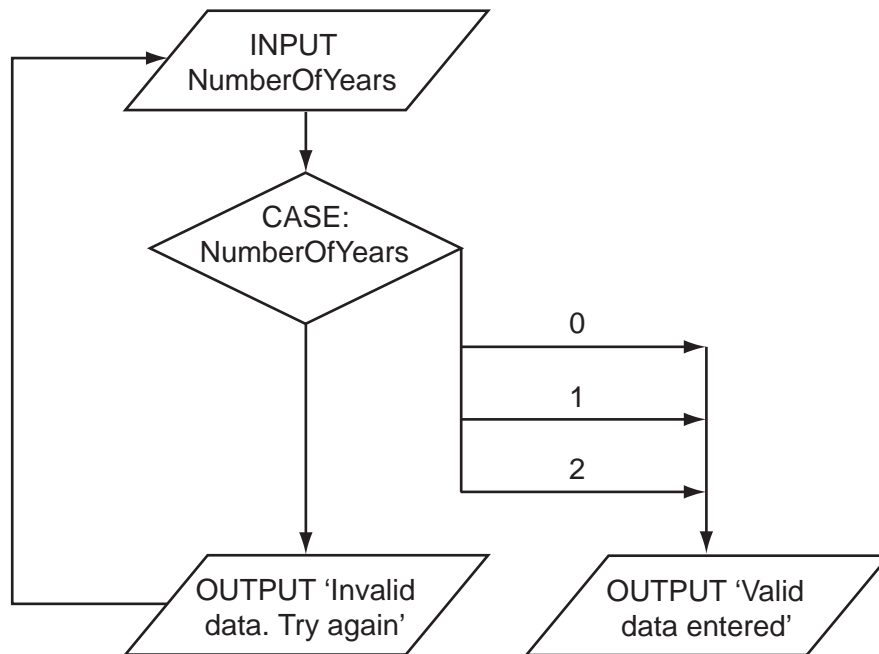
(ii) Write a Boolean expression to validate FreeTexts.

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

(iii) Describe a possible problem that could occur if ContractLength is not validated.

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

- 2 Ahmed is writing a program to record the data of members of the school football squad. The input data will be validated. One input is the number of years a member has played for the team. This will be 0, 1 or 2. The flowchart for the validation of number of years is shown below.



- (a) (i) What is the output when the input is 2?

..... [1]

- (ii) What is the output when the input is 3?

..... [1]

(b) In a high-level language, write the code that will produce the validation process shown in the flowchart.

Language .....

Code .....

.....

.....

.....

.....

.....

.....

..... [5]

(c) The three basic programming constructs used to control the flow of information are: sequence, selection and iteration.

State the **two** constructs that are used in your code.

1 .....

2 ..... [1]

(d) Describe what is meant by iteration.

.....

.....

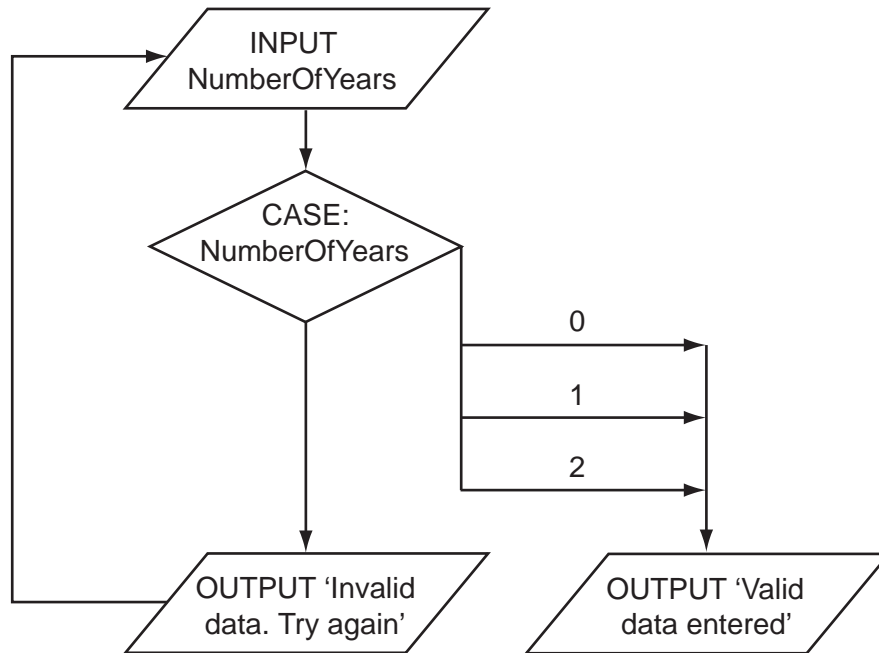
.....

..... [2]

- (e) Ahmed thinks it will be a good idea to allow only five attempts at getting the input data correct. If it is not a valid entry after five attempts, then a message 'Please check which values are allowed' should be output.

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Modify the flowchart to include this additional check.



[5]

- (f) Ahmed needs to store more information about the players. He creates a record structure that contains PlayerID (a whole number between 1 and 50), Sex (m or f), PlayerName, NumberOfYears and DateOfBirth. Complete the table.

Field Name	Data Type	Field Size (bytes)
PlayerID		
Sex		
PlayerName		
NumberOfYears		
DateOfBirth		

[10]



(g) The squad has 30 members. Ahmed stores the records in an array called Squad. To calculate how many females there are he designs this pseudocode.

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```

NoOfFemales ← 0
Index ← 1
WHILE Index < 30
    IF Squad[Index].Sex = 'f'
        THEN
            NoOfFemales ← NoOfFemales + 1
        ENDIF
    Index ← Index + 1
ENDWHILE

```

This pseudocode will only consider the first 29 records in the array.

(i) State the name of this type of error.

..... [1]

(ii) State the line that needs changing.

..... [1]

(iii) Rewrite the line to ensure that the pseudocode will consider all 30 records.

..... [1]

(h) Write this updated pseudocode using a FOR loop ensuring that it will check all records in the array.

.....

.....

.....

.....

.....

.....

..... [3]

3 Aisha is learning about manipulating strings in a high-level programming language. She has an idea that she wants to try. She produces the following design in pseudocode:

```

FUNCTION Surprise(MyWord : STRING) : STRING
    LOOP FOR i ← 1 TO LENGTH(MyWord)
        TempNo ← ASCII(MyWord[i]) + 1
        TempWord[i] ← CHAR(TempNo)
    ENDOLOOP
    Surprise ← TempWord
ENDFUNCTION
    
```

(a) Complete the trace of this function for the function call Surprise('cab').

MyWord	i	LENGTH (MyWord)	TempNo	TempWord[1]	TempWord[2]	TempWord[3]	Surprise
cab							
	1						
		3					
			100				

[3]

(b) State what this function does.

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

(c) Describe what Surprise ← TempWord does.

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

(d) High-level languages also use procedures.

Describe the features of a procedure.

.....

.....

.....

.....

.....

.....

..... [3]

(e) Aisha has written her pseudocode so that it should be easily understood.

(i) State **two** techniques that she has used in her pseudocode to do this.

1 .....

.....

2 .....

.....

..... [2]

(ii) One other technique to help understanding is to annotate using comments.

Write a suitable comment to annotate the lines:

```
TempNo ← ASCII(MyWord[i]) + 1
TempWord[i] ← CHAR(TempNo)
```

.....

.....

.....

.....

.....

.....

..... [3]

(f) Aisha finds out that there is a string manipulation function called `CONCATENATION`.

State what is meant by concatenation.

.....

.....

.....

..... [2]

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