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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
ADVANCED SUBSIDIARY GCE**

F452

COMPUTING

Programming Techniques and Logical Methods

FRIDAY 15 MAY 2009: Morning

DURATION: 1 hour 30 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

None

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- **Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes on the first page.**
- **Use black ink. Pencil may be used for graphs and diagrams only.**
- **Read each question carefully and make sure that you know what you have to do before starting your answer.**
- **Answer ALL the questions.**
- **Write your answer to each question in the space provided, however additional paper may be used if necessary.**

INFORMATION FOR CANDIDATES

- **The number of marks is given in brackets [] at the end of each question or part question.**
- **The total number of marks for this paper is 100.**

- 1 (a) Programming constructs determine the way in which statements in a program are executed.

Three types of programming constructs are sequence, selection and iteration.

Describe what is meant by each of these.

Sequence _____

_____ [2]

Selection _____

_____ [2]

Iteration _____

_____ [2]

(b) A computer program contains the following instructions

```
X = 5  
Y = 7  
X = Y  
OUTPUT X
```

(i) State which of the constructs in part (a) has been used.

_____ [1]

(ii) State the value which will be output.

_____ [1]

(c) Another computer program contains the following instructions.

```
INPUT X  
INPUT Y  
Z = -1  
REPEAT  
    Z = Z + 1  
    Y = Y - X  
UNTIL Y < 0  
OUTPUT Z
```

(i) For each of the following sets of input data, complete the table opposite showing the values of the variables X, Y and Z AFTER the instructions have been executed, and the output.

You may use the extra column for rough work. [12]

INPUTS	X	Y	Z	OUTPUT
3, 9				
5, 7				
8, 2				

(ii) Explain what this algorithm does.

[2]

(iii) The program is given the inputs: - 4, 12

Explain why this will produce an error and state the type of error it will produce.

Type of error: _____ [3]

- (d) A utilities company provides both gas and electricity. Customers whose bills when added together exceed £10 are given a 5% discount on this total.

The following code has been written to calculate the total bill of customers including the discount, if any.

```
01 INPUT GasBill
02 INPUT ElectricBill
03 If GasBill AND ElectricBill > 10 THEN
04  TotalBill = GasBill + ElectricBill * 0.95
05 Else
06  TotalBill = GasBill + ElectricBill
07 END IF
```

This code contains an error in line 03 and another error in line 04.

- (i) Explain why there is an error in line 03 and state the type of error.

Explanation _____

Type or error _____ [3]

(ii) Explain why there is an error in line 04 and state the type of error.

Explanation _____

Type of error _____ **[3]**

2 A parcel delivery company has a website where customers can arrange for parcels to be collected and delivered.

(a) Using the table below, state and justify THREE separate items of data which the customer will need to provide. An example has been completed.

ITEM OF DATA NEEDED	REASON WHY IT IS NEEDED
Delivery postcode	So that the driver can arrange the most efficient route

[6]

- (b) Drivers in the company need the postcodes sorted in ascending order. A computer program sorts the postcodes, as strings, in ascending order.

The table below shows a sample of the data entered by customers, the result after the program sorts the data and what the drivers need.

Postcodes entered by customers	Postcodes after the program sorts them	Postcodes in the order that the drivers need them
BF1 3UY BF21 1XX BF12AJ BF2 0GH BF18 4TZ bf2 0ed	BF1 3UY BF12AJ BF18 4TZ BF2 0GH BF21 1XX bf2 0ed	BF1 2AJ BF1 3UY BF2 0ED BF2 0GH BF18 4TZ BF21 1XX

(c) One way to prevent the problem described in part (b) is to use validation when the customer inputs the postcode.

(i) Explain the term validation.

[2]

- (ii) Describe THREE validation checks that can be used on the postcode.

Validation Check 1 _____

Validation Check 2 _____

Validation Check 3 _____

[6]

3 A company is writing a program to control the lift in a 5-storey building.

The program uses an array called `LiftCalled()` to store whether the lift has been called on each floor.

(a) Explain what is meant by an array.

[2]

The structure of the array used is shown in the table below.

Each row represents a floor of the building. The first column stores whether a lift is wanted to go UP from that floor, and the second column stores whether the lift is wanted to go DOWN from that floor.

	1(UP)	2(DOWN)
1	FALSE	FALSE
2	TRUE	FALSE
3	TRUE	FALSE
4	FALSE	TRUE
5	FALSE	FALSE

← LiftCalled(4, 2)

(b) In the table above the value of LiftCalled(4,2) is TRUE. This means that the lift has been called to go DOWN from the fourth floor.

State the value of LiftCalled(2,1) and explain what it means.

Value _____

Explanation _____

_____ [3]

(c) When the lift is called from a floor (by pressing either UP or DOWN outside the lift door) the program executes a subroutine ButtonPressed. This subroutine updates the contents of the array LiftCalled by inserting TRUE in the cell which corresponds to the floor on which the lift is called and the direction wanted.

The algorithm for this subroutine is given below in pseudocode.

SubRoutine ButtonPressed (Floor : Integer, Direction : String)

IF Direction = "UP" THEN

LiftCalled(Floor,) = TRUE

ELSE

LiftCalled(..... , 2) =

END IF

End SubRoutine ButtonPressed

- (i) Fill in the THREE spaces in the algorithm. [3]
- (ii) State the names of the parameters of the subroutine.

_____ [2]

(d) Supervisors can call the lift using an override facility.

This uses a subroutine call SupervisorCall.

This subroutine has one parameter, Floor (the number of the floor where the supervisor is.)

The subroutine sets the UP and DOWN values for the designated floor to TRUE, and all other values in the array to FALSE.

Write the code for the subroutine SupervisorCall in a high level language. You should state the name of the language you have used and use good program writing techniques to ensure that your code can be understood by another programmer.

Name of Language _____

Code

[6]

4 A programmer is producing a computer program which allocates seats to customers in a small theatre.

(a) The code for the program uses variables and constants.

(i) Describe what is meant by a variable.

[2]

(ii) State how a constant is different from a variable.

[1]

(iii) Describe how using constants can help improve the maintainability of the code.

[2]

(b) Some variables used by the program are given below.

For each variable, state its data type and give ONE reason why this data type is suitable.

(i) Variable: NoTickets (The number of tickets wanted)

Data Type _____

Reason _____

_____ [2]

(ii) Variable: SeatAvailable (Whether a seat can be booked)

Data Type _____

Reason _____

_____ [2]

(iii) Variable: SeatNumber (For example F7, meaning the seat is in row F, number 7)

Data Type _____

Reason _____

_____ [2]

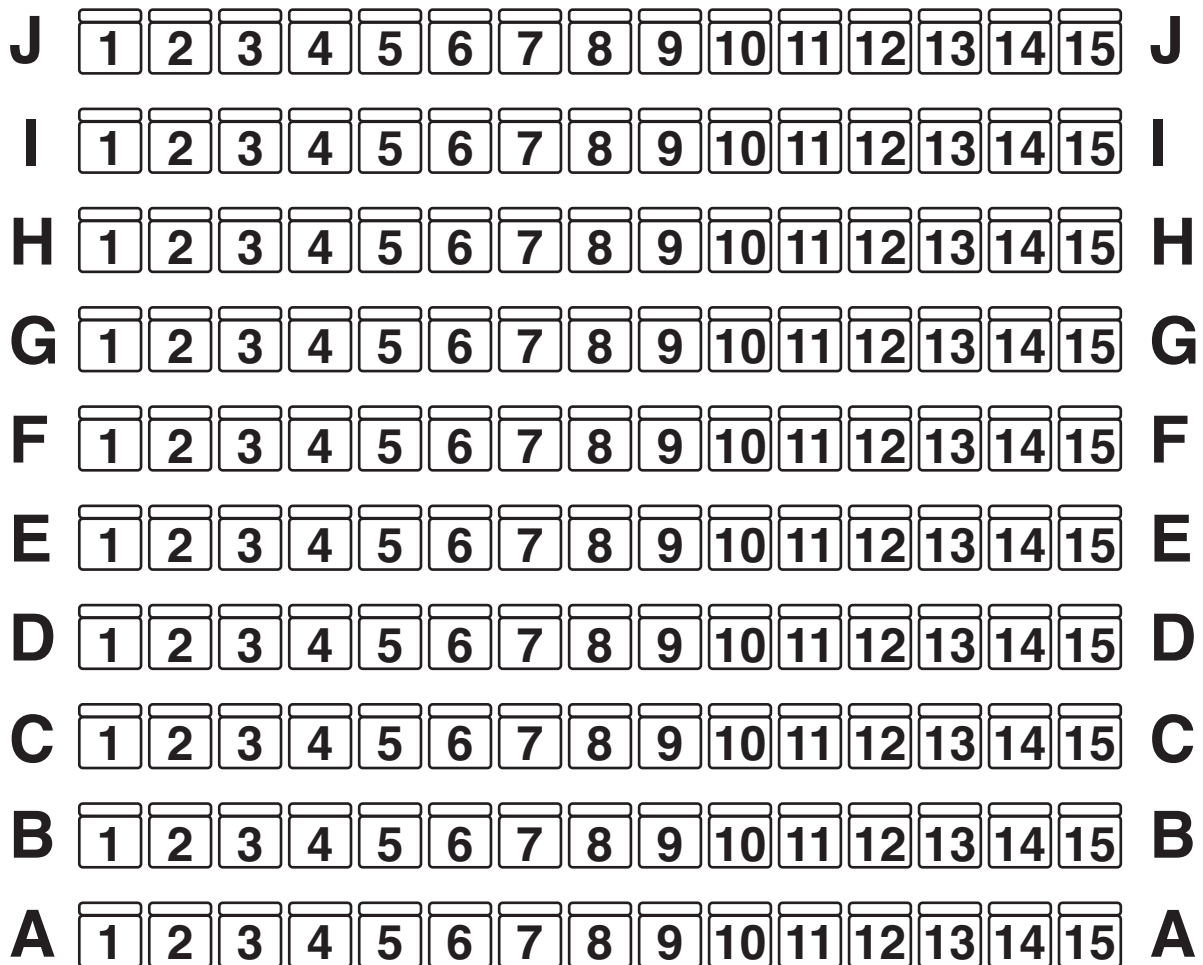
(iv) Variable: TotalPrice (The cost of the tickets booked by the customer)

Data Type _____

Reason _____

_____ [2]

(c) The theatre has 10 rows, labelled A to J from front to back, and 15 seats in each row, numbered 1 to 15 from left to right.



ORCHESTRA

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