

**Monday 23 January 2012 – Afternoon**

**AS GCE COMPUTING**

**F452/01** Programming Techniques and Logical Methods

Candidates answer on the Question Paper.

**OCR supplied materials:**

None

**Other materials required:**

None

**Duration:** 1 hour 30 minutes



Candidate forename		Candidate surname	
-----------------------	--	----------------------	--

Centre number						Candidate number				
---------------	--	--	--	--	--	------------------	--	--	--	--

**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

**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**.
- This document consists of **20** pages. Any blank pages are indicated.

1 Marek is designing a program for his local library to enable members to issue and return books themselves and pay a fine if the books are overdue.

(a) Marek's test strategy includes beta testing and acceptance testing.

(i) Describe what is meant by beta testing and how it can be used to test Marek's program.

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

(ii) Describe what is meant by acceptance testing and how it can be used to test Marek's program.

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

(b) The library uses the following method to decide whether or not a fine is due.

- If the book is returned within 14 days after it was issued then no fine is due.
- If the book is returned after 14 days, a fine is due.

Marek's program includes a function for determining the fine. Marek plans to test this function using black box testing.

Complete the table with **three** different test cases assuming that a book is borrowed on 1<sup>st</sup> February 2012.

Type of test data	Test data	Expected outcome
Normal		
Borderline		
Invalid		

[6]

(c) As part of his program design, Marek produces a list of variables and their data types.

Complete the table below to show the most appropriate data type for each variable.

Variable name	Description	Data type
DateBorrowed	The date on which a book was borrowed	
DaysBorrowed	The number of days a book has been borrowed	
Fine	The amount of the fine to be charged	
BankCardNumber	The number of the current user's bank card	
TransactionOK	A flag to show if a payment transaction succeeds	

[5]

(d) Members will be able to scan and return books themselves. To help them complete their transaction Marek's program uses sound output as well as a monitor.

Describe **two** ways that sound can be used to enhance the interface.

1. ....  
.....  
.....  
.....  
.....
  2. ....  
.....  
.....  
.....
- [4]

- 2 An athlete preparing for the Olympic Games does a timed 400m run once a week. She keeps a record of the date and time taken for each run in a file on her computer.

An example of the data in the file is shown below:

05/12/2011, 53.01
12/12/2011, 51.31
19/12/2011, 50.01
26/12/2011, 55.02
02/01/2012, 56.15
08/01/2012, 53.11

- (a) (i) Describe what is meant by a serial file and a random file.

Serial file .....  
.....  
.....  
..... [2]

Random file .....  
.....  
..... [2]

- (ii) The data file is a serial file.

Justify why the athlete's training data should be organised in this way.  
.....  
..... [2]

The program on her computer has a routine which outputs the fastest time she has achieved, and the date it was achieved.

The algorithm for this routine is shown below:

```

01 OPEN DataFile in INPUT MODE
02 READ NextDate, NextTime FROM DataFile
03 FastestTime = NextTime
04 DateOfFastestTime = NextDate
05 WHILE DataFile is not at end of file
06     READ NextDate, NextTime FROM DataFile
07     IF NextTime ..... FastestTime THEN
08         FastestTime = NextTime
09         DateOfFastestTime = .....
10     END IF
11 END WHILE
12 OUTPUT FastestTime
13 OUTPUT DateOfFastestTime
14 CLOSE .....

```

**(b)** Complete lines 07, 09 and 14 in the algorithm. **[3]**

**(c)** Explain why line 03 is necessary in this algorithm.

.....

.....

.....

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

**(d)** The algorithm uses iteration and selection.

**(i)** State what is meant by iteration and give the line number(s) where it is used.

.....

.....

.....

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

(ii) State what is meant by selection and give the line number(s) where it is used.

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

(e) By using string manipulation functions in a high level language, rewrite lines 12 and 13 so that the output is a user-friendly sentence.  
State the name of the high level language you have used.

Name of Language: .....

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

(f) Write an algorithm, in pseudocode, for a function which returns the time on the athlete's last training run.

The algorithm should:

- use the file DataFile
- find the most recent entry in the file
- extract and return the time from that entry

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [5]

3 A teacher of A-Level Computing wrote the following function which checks whether a student has achieved an A\* grade.

```
01 FUNCTION HasDoneIt
02 INPUT a
03 INPUT b
04 INPUT c
05 INPUT d
06 RETURN ( (c+d) >= 180 ) AND ( (a+b+c+d) >= 320 )
07 END FUNCTION
```

(a) Explain the need for parentheses in line 06.

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

(b) The function is tested with a = 60, b = 70, c = 100, d = 80.

State the value which will be returned on line 06, showing your working.

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

(c) The code contains identifiers.

(i) State what is meant by an identifier.

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

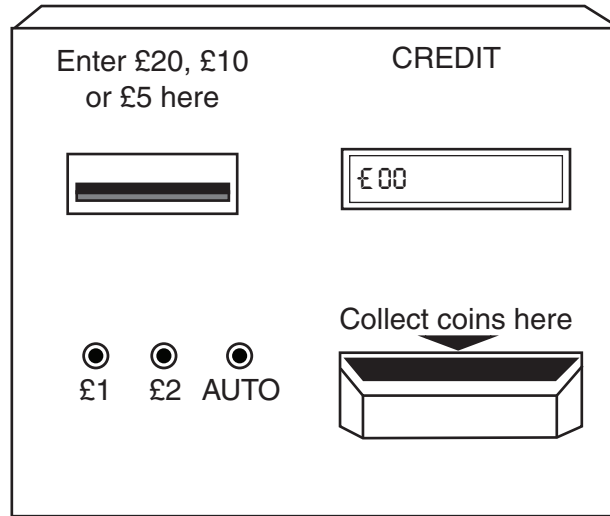
(ii) List **all** the identifiers in the code.

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





- 4 A fairground has a coin dispensing machine, where people can insert £5, £10 or £20 notes and receive £2 and £1 coins in return.



When a customer enters a bank note, the value of the note is added to credit. If the customer presses the button for a coin and that coin is available, the coin is given out and the value of the coin subtracted from credit.

- (a) After only 1 bank note has been entered and only three coins taken, the display shows £15.

State the value of the bank note which was entered and the coins taken.

Value of bank note entered .....

Values of coins taken .....

[2]

A computer program is written to control the machine.

The program uses two variables called Count\_of\_2s and Count\_of\_1s to represent how many £2 and £1 coins there are in the machine.

- (b) (i) Write an expression which uses the value of Count\_of\_2s and Count\_of\_1s to calculate the total value of the coins in the dispenser.

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

- (ii) Write an assignment statement which assigns the value you calculated in part (i) to a variable called Total\_value\_of\_coins.

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

- (iii) Each time a transaction is complete, the machine checks how much money is left in the machine. If the total value of coins is less than £20 the machine shuts down. Write an expression which can be used as a condition to test if the value of coins is too low and the machine needs to shut down.

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

- (c) The program contains procedures which are executed when each button is pressed.

Describe what is meant by a procedure.

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

(d) The program uses the variable Credit.left to store the amount of money remaining from the note that was inserted. When the £2 button is pressed the following code is executed. The code contains errors.

```
01 PROCEDURE Button_2_pounds_pressed
02     IF Credit_left > 2 THEN
03         IF Count_of_2s > 0 THEN
04             Drop_2_pound_coin
05             Count_of_2s = Count_of_2s - 1
06     END IF
07 END PROCEDURE
```

(i) Explain the error in line 02, and state what type of error this is.

.....  
.....  
.....  
.....

Type of Error ..... [3]

(ii) Explain why there is an error after line 05, and state what type of error this is.

.....  
.....  
.....  
.....

Type of Error ..... [3]

(iii) State the name of another type of error.

..... [1]



- (f) If the customer presses the button AUTO the machine automatically gives change to the value of the customer's credit from the coins available using as few coins as possible.

Produce an algorithm for the procedure Button\_auto\_pressed.

Your algorithm should:

- use the value of the variable Credit\_left to determine how much change to give, and update this variable correctly,
- call the procedures Drop\_2\_pound\_coin and Drop\_1\_pound\_coin to actually drop the coins into the collection tray,
- update the values of the variables Count\_of\_2s and Count\_of\_1s correctly to reflect the number of coins left in the machine.

(The quality of written communication will be assessed in your answer to this question.)



- 5 A program for IT technicians in a school uses a command line interface (console application) to manage the users on the network.

The program contains the following subroutine for its main menu.

```
01 SUBROUTINE Menu()  
02     OUTPUT "Enter Command: "  
03     INPUT Command  
04     SELECT CASE Command  
05         CASE "New"  
06             CALL NewUser()  
07         CASE "Delete"  
08             CALL DeleteUser()  
09         CASE "Pwd"  
10             CALL Security()  
11         CASE "Quit"  
12             END  
13     CASE ELSE  
14         OUTPUT "Invalid Command. Please try again"  
15     END SELECT  
16     CALL Menu()  
17 END SUBROUTINE
```

- (a) The program has been written in a modular structure using subroutines.

State **three** benefits of using this modular structure when writing the program.

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

- (b) Explain why it is better to use a SELECT CASE structure to implement the menu, rather than IF statements.

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



(c) The subroutine Menu() uses recursion.

(i) State the line number where recursion is used.

..... [1]

(ii) Explain how the code can be changed to use iteration instead of recursion.  
You may refer to lines of code from the program in your answer.

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

(iii) Describe the **main** advantage of using iteration instead of recursion in this case.

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

**18**  
**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

**19**  
**BLANK PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**

**PLEASE DO NOT WRITE ON THIS PAGE**



**Copyright Information**

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website ([www.ocr.org.uk](http://www.ocr.org.uk)) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, First Floor, 9 Hills Road, Cambridge CB2 1GE.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.