OCR
Oxford Cambridge and RSA

GCE

Computing

Unit **F452:** Programming Techniques and Logical Methods

Advanced Subsidiary GCE

Mark Scheme for June 2016

Question			Answer/Indicative content	Mark	Guidance
1	a		• Logical flow of layout (i.e. flow left to right, top to bottom) • °c or deg C shown for all values displayed • Label and space for data output of Maximum Highest and lowest values… • … Current Highest, lowest and average values … • … in the correct format for data (sign,digit, dot, digit)	5	Space for data must be shown.

M	A	X								D	e	g		C
				H	I	G	H			+	6	.	7	
				L	O	W				-	3	.	2	
C	U	R	R	E	N	T								
				H	I	G	H			+	4	.	6	
				L	O	W				-	1	.	8	
				A	V	E				+	2	.	4	

Question			Answer/Indicative content	Mark	Guidance
b	i		<table><tr><td></td><td>**Data Type**</td><td>**Size in bytes**</td></tr><tr><td>Date (dd/mm/yyyy)</td><td>STRING/CHAR</td><td>10</td></tr><tr><td>Time (hh:mm:ss)</td><td>STRING/CHAR</td><td>8</td></tr><tr><td>Sensor 1</td><td>REAL</td><td>4 or 8</td></tr><tr><td>Sensor 2</td><td>REAL</td><td>4 or 8</td></tr><tr><td>Sensor 3</td><td>REAL</td><td>4 or 8</td></tr><tr><td>Sensor 4</td><td>REAL</td><td>4 or 8</td></tr><tr><td>Sensor 5</td><td>REAL</td><td>4 or 8</td></tr><tr><td>Error Flag</td><td>BOOLEAN</td><td>1</td></tr></table> • Date - type and size • Time – type and size • Sensor 1 … Sensor 5 – type and size • Error Flag – type and size	4	Allow 2 or 4 bytes per character (unicode) for Date & Time (i.e. 20 or 40 bytes) Allow date (8 bytes), time (8 bytes), long int (4 bytes) instead of STRING/CHAR Allow decimal/float/double instead of REAL Allow byte or short int for Error Flag
	ii		• record size • 60*60*3 * record size (10800 * record size) • System overheads 10 – 20% • converted to KB divide by 1024	4	Record size allow FT Accept divide by 1000

Question			Answer/Indicative content	Mark	Guidance
	c	i		6	One mark for each correct box on row 1 & 2. One mark for correct row 3
		ii	• If file does not exist … • … create file • Open file … • ... as append … • ... write record to file ... • Close file	6	

Question			Answer/Indicative content	Mark	Guidance

	d		**Fixed length record**
			    A record where the number of bits (bytes) in a record is decided in advance at the design stage.
			    The length is constant and cannot be changed later.
			    The length is normally described in bytes or characters
			    Each field must be able to hold the maximum value of data … so there may be wasted space
			
			Variable length record
			    A record where the numbers of bits (bytes) is not predetermined.
			    The length is normally described in bytes or characters
			    The length of each record is governed by the amount of data to be stored.
			    Less waste of space when holding data such as strings (i.e. date and time) … hence less disk/memory space taken, so more trips can be fitted on memory card.
			    Quicker to transmit.
			
			Use comparison
			    Fixed length records are easier to process as … the number of records in a file are easily calculated … and able to jump to a certain record within the file… by calculation of the record number * length of record.
			    Variable length records have greater overheads in terms of processing … as you have to find the start and end of each record.
			    Variable length records may also have an extra field to hold the length of the record or extra data attached to each field to indicate its length.
				8	Levels of responses
					
					High Level response [6-8marks]
					
					Candidates will identify the main features of fixed length and variable length records. The comparison between the two record types will be fully relevant to this case. Technical terms will be used correctly. The information will be presented in a structured and coherent format, with few errors of grammar, punctuation and spelling. [Good account of both record types]
					
					Medium level response [3-5 marks]
					
					Candidates will identify some features of fixed length and variable length records. The comparison between the two record types maybe one-side and may not be fully relevant to this case. Technical terms will mainly be used correctly. The information will be presented in a structured format, with limited errors of grammar, punctuation and spelling. [Good account of one record type or reasonable account of both]
					
					Low level response [0-2marks]
					
					Candidates may identify some features of fixed length and/or variable length records. The comparison between the two record types will be either very limited or non-existent. Technical terms maybe limited in use or incorrectly used. Errors of grammar, punctuation and spelling maybe intrusive. [Random points!]

Question			Answer/Indicative content	Mark	Guidance
2	a	i	• Online development • Create prototype ... • which may not be fully functional • evaluate/tested and give feedback … • … modify prototype … • … and cycle round till accepted	5	
		ii	• Problem defined (in simple terms) then • … split into small subtasks … • … each subtask successively split/refined … • … until small enough to understand and program	4	
	b		• Black box • Checks that given inputs give the correct output • No understanding of the code (not looking at the code). • White box • Understands the structure and logic of the program • Each line/path of code is tested • Dry-run/Walkthrough • Manually execute using defined inputs • Creating a trace table • Alpha • restricted audience of testers (within developer's company) • the version maybe incomplete or have (known) faults • Inspection • During a meeting a small team will read through code • Analysing it with a checklist which list the common problems	9	Do not accept Beta or Acceptance testing One mark for naming test and 2 marks for description.

Question			Answer/Indicative content	Mark	Guidance
3	a	i	• Logical • Line 06 change AND to OR	2	
		ii	• Use of comments … • … (an example within context) • More meaningful variable names … • … such as Pointer/Position • Use of indentation … • … such as lines 2 to 10	4	Allow constants instead of meaningful names as long as relevant example from code given i.e. such as firstSlash= 3 or secondSlash=6 in line 06
		iii	• Correct first 3 characters • Correct 4th & 5th characters • Correct 6th, 7th & 8th characters • Correct 9th to 14th characters • Correct use of concatenation Example answer: Username=Username+LEFT(FirstName,3) UserName=Username+RandomDigit(DoB)+RandomDigit(DoB); UserName=UserName+ RIGHT(Surname,3) UserName=Username+LEFT(DoB,2)+MID(DoB,4,2)+RIGHT(DoB,2)	5	Accept python format if correct eg. FirstName[0:2] In this case accept MID(DoB,3,2)
		iv	• A function returns a single data type (value) • Whereas a procedure can pass (back) many values … • … by parameter • A function can be used in line (as part of a statement) • A function can be used as a variable • A procedure is used as any other program instruction (statement)	6	Do not accept 'return' Function has a declared type/can be used "as variable"

Question			Answer/Indicative content	Mark	Guidance
	b		• Iteration... • ...Example should be either a FOR, WHILE or REPEAT … UNTIL • Selection... • ...Example should be either an IF, SWITCH, CASE or SELECT • Sequence... • ...Example should be at least two consecutive lines of code	6	Do not accept 'loop' All examples must be code, do not credit explanations. Allow examples from given code
	c	i	• Identifier/name of a … • Memory location used to store data	2	
		ii	• A range of statements/procedure/function/method that a variable is valid for • A local variable takes precedence over a global variable of the same name/allow the same identifier to be used for different purposes without conflict	2	Accept block of code

Question			Answer/Indicative content	Mark	Guidance

4	a		• Open Favourites.dat
			• Set FOUND flag to FALSE
			• Loop { includes correct end condition }
			• Read record from Favourites file
			    If record from Favourites file = barcode passed …
			• … FOUND flag set to TRUE
			Until EOF Favourites.dat OR FOUND=TRUE
			Close Favourites file
			• IF FOUND = FALSE
			  Open Favourites file
			• Write barcode to Favourites file
			• Close Favourites file
				8	Ignore for this question file open mode (i.e. WRITE,READ & APPEND)
					
					Allow the use of flags to indicate EOF of files
					
					Accept flow chart solutions – if the flow is right for item fond and not found also award bullet points 2, 5 & 6 (Found flag)
					
					A fully working solution should be given full marks regardless of efficiency.

	b		Basic structure to be described:
			
			  Open file
			• Loop { includes correct end condition }
			    o Read record
			    If target = record read
			       • Return found
			    End if
			    o If target > record read
			       Return not found
			    End if
			  Until EOF
			  Close file
			• Return not found
				5	Accept a binary search
					• Find centre point
					• Is target equal to value? If yes return found
					• If left pointer = right pointer then return not found
					• Else take correct subset
					• Repeat bullets 1, 2, 3 & 4

Question			Answer/Indicative content	Mark	Guidance
5	a	i	(table below)	3	If zero marks then mark the first row. Ignore duplicate zeros at the end of the first 4 columns.

Value	P	X	M	OUTPUT
4082	408	4080	2	2
408	40	400	8	8
40	4	40	0	0
4	0	0	4	4
(0)				+

- Columns Value & P correct
- Columns X & M
- Column OUTPUT correct

Question			Answer/Indicative content	Mark	Guidance
		ii	(table below)	2	

Value	P	X	M	OUTPUT
-243	-24	-240	-3	-3
(-24)				+

- Columns Value, P and X correct
- Columns M & OUTPUT correct

Question			Answer/Indicative content	Mark	Guidance

	b		Example answer:
			
			PROCEDURE ChangeInteger(Value:INTEGER)
			
			    INTEGER P, X, M
			   BOOLEAN NegativeFlag = FALSE
			
			    IF Value < 0 THEN
			        Value = Value * -1
			        NegativeFlag = TRUE
			   END IF
			
			    REPEAT
			
			        P = Value DIV 10
			        X = P * 10
			        M = Value – X
			        OUTPUT M
			        Value = P
			
			    UNTIL Value <= 0
			
			IF NegativeFlag = TRUE THEN
			       OUTPUT '-'
			ELSE
			       OUTPUT '+'
			END IF
			
			END PROCEDURE
			
			• Checking to see if Value is less than zero
			• Correct output of negative value digits …
			• … and still correctly outputting positive value digits.
			• Output of correct sign
				4	
					
					Alternative possible solution is to use ABS(M).

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