OCR
Oxford Cambridge and RSA

GCE

Computing

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

Advanced Subsidiary GCE

Mark Scheme for June 2014

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All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Question			Answer	Mark	Guidance
1	a		*one mark for correct value for each output, from left to right:* • HEXAGONAL • RHOMBIC • PARALLELOGRAM	3	cao
	b	i	• A name /location in memory/identifier • Used to store a value <u>which can change</u> during execution	2	
		ii	• *x, y, A*	1	cao
	c	i	*Example: IF (A>=88) AND (A<=92) THEN* *Award marks for a range that* • includes 90 • has the correct limits	2	Accept >87 as equivalent to >=88 etc... (i.e. candidates may assume that A is an integer)
		ii	*Example: IF (x – y) <0.1*x) OR ((y – x) <(0.1*x) THEN* *Award marks for answers that* • find the difference between x and y • find the difference between y and x • work out 10% of x • comparison between difference	4	Accept multi-staged answers, and use of an ABS function or |x-y| Do not except DIV
	d	i	• Testing done by the programmer / Beryl/Developers employee(s)	1	
		ii	• Using the <u>source</u> code • Check every possible path/condition statements • Dry Runs/Trace Tables	2	Accept statements

	Question		Answer	Mark	Guidance
		iii	*Award marks in groups of three, for:* • Outcome: Rectangle • Reason :Angle 90 and difference between x and y >= 10% of x • Test data matches the expected outcome • Outcome: Square • Reason: Angle 90 and difference between x and y <10% of x • Test data matches expected outcome	6	Note: If expected outcome is wrong then do not award marks for other columns
2	a		• AnnualInterest (= 600 * 10 / 100)= 60 • TotalToPay (= (60 * 5) + 600) = 900 • MonthlyPayment (=900 / (5 * 12))=15	3	Allow follow through **if working shown**
	b	i	• * has higher precedence than +	1	Allow follows rules of BODMAS / BIDMAS
		ii	• Make the <u>formula/line</u> easier to understand/read... • ... as contents of bracket stands for total interest	2	Do not allow code/program
		iii	• So the formula is calculated correctly • The * is <u>done before</u> the \	2	The 2nd bullet is worth two marks if that is the only point made
	c		• Constant: InterestRate • Defined at the start…. • …where it can be changed if necessary/cannot be changed <u>during execution</u> • Makes reading the algorithm more understandable *(1 mark for identifying the constant, plus any other 2)*	3	cao

Question			Answer	Mark	Guidance

	d		*Example:*
			``
			INPUT Amount
			INPUT Years
			PRINT
			  ("Year","Start","Paid in","Interest","Final")
			Final = 0
			FOR y = 1 to Years
			   Start = Final
			   Interest = (Start + Amount)* 0.10
			   Final = Start + Amount + Interest
			   PRINT (y, Start, Amount, Interest, Final)
			NEXT y
			``
			
			Award marks for:
			• Inputs amount and number of years
			• Appropriate initialisation before loop/Output header line
			• Loop correctly set for the number of years
			  (And within the loo)p:
			  • Correctly determines the start amount
			  • Correctly calculates interest to pay
			  • Correctly calculates final amount
			  • Output in appropriate format
				7	

3	a	i	• (A description of) an item of data • That is passed to a subroutine (when it is called)… • …is used as a variable within the subroutine	2	
		ii	- Message: String - PhoneNumber: String *One mark for correct names of parameters + one mark each for the data types.*	3	*Parameter names cao* *If parameters are misspelt/wrong case, data type marks can be awarded*
	b		• NotInDictionary: Function • CheckAnswer: Function • SendMessage: Procedure	3	

Question			Answer	Mark	Guidance
	c		• When comparing characters, upper and lowercase characters don't match • Because they have different character codes	2	*Except values instead of character codes*
	d		• Checks the length of the message… • … to ensure there are exactly <u>6 characters</u> / … otherwise reports an incorrect length • Checks that the existence of the word… • … in company's dictionary / otherwise reports an unknown word	4	

Question			Answer	Mark	Guidance	
					Content	**Levels of response**
3	e		*Points made may include:* Random file: - A section of disk is reserved for the words - Uses a hash algorithm to determine the address of each word - Example algorithm - Wasteful on space (no-clash hash algorithm will require space for every combination of six characters) - Clashing can occur and has be dealt with Indexed sequential file: - Words will be stored in alphabetical order - Separate index kept which allows you to access <u>groups</u> of words - e.g. addresses of first letters / other example of indexing - the group has to then be searched to find the word - More space efficient	8	Candidate may recommend keeping the random file(on grounds of speed) or converting to indexed sequential (on grounds of speed). Either recommendation is fine, but in a higher level response the recommendation should clearly follow from the points made.	**High level response [6-8 marks]** Candidate evaluates the use of random and indexed sequential files, in a way that is highly relevant to this case. Features are compared/contrasted and recommendations/conclusions clearly follow from points made. The information will be presented in a structured and coherent form. There will be few if any errors in spelling, grammar and punctuation. Technical terms will be used appropriately and correctly. **Medium level response [3-5 marks]** Candidate gives some features of random and indexed sequential files, some of which are relevant to this case. Evaluation may be one-sided. Recommendations/conclusion has some justification but this may be vague or not follow from the rest of the response. The information will be presented in a structured format. There may be occasional errors in spelling, grammar and punctuation. Technical terms will be mainly correct. **Low level response [0-2 mark]** Candidate may identify some features of random and/or indexed sequential files. There is little or no comparison or recommendation based on these. Information will be poorly expressed and there will be a limited, if any, use of technical terms. Errors of grammar, punctuation and spelling may be intrusive.

Question			Answer	Mark	Guidance
3	f	i	• ?IN?ER • ??????	2	Allow quotation marks

		ii	*Example:*
			`FUNCTION CheckAnswer(Message : String)`
			`    Temp = ""`
			`    FOR i = 1 to 6`
			`        IF Message[i] = CorrectWord[i] THEN`
			`            Temp = Temp + Message[i]`
			`        ELSE`
			`            Temp = Temp + "?"`
			`        END IF`
			`    NEXT i`
			`    RETURN Temp`
			`END IF`
			
			Award marks for:
			• Initialising a variable to collect the result
			• Loops from the first character in the message…
			• ... through each character, to the last
			• Compares with corresponding character in CorrectWord….
			• ... and places correct data in result
			• Outputs/Returns the result
				6	Candidates will typically use indices or string manipulation functions to isolate characters. Either solution is fine.
					
					As it implies initialising of results - two marks for:
					
					`IF Message[i] = CorrectWord[i] THEN`
					`    Message[i]= "?"`
					`END IF`
					
					If "RETURN Temp" is outside of loop award mark even if Temp holds incorrect value
					
					If loop is missing or not ended then no marks for bullet points 2 and 3

4	a		• Dropdown buttons only for input... • ... ensures that only valid colours can be entered • Logical ordering • ... left to right, top to bottom • Visual confirmation of input • ... pupils can compare image with resistor • Visual display of output… • ... results are prominently shown	6	Mark in pairs - 1 mark for stating the point and 1 mark for a further description. Second point does not depend on the correct first point

Question			Answer	Mark	Guidance
b			• Selection	1	
c	i		• Statements shifted (to the right)/Statements which are contained within a block / other statements are preceded by spaces	1	
	ii		• Allows you to easily see where the block starts and ends • example from code given (line 22 or 24)	2	Do not accept easier to understand
d	i		• Tolerance = 10%	1	cao Allow quotation marks
| | ii | | *Example:*<br>```
IF ColourBand4 = "Gold" THEN
    Line2 = "Tolerance = 5 %"
ELSE
    IF ColourBand4 = "Silver" THEN
        Line2 = "Tolerance =10 %"
    ELSE
        Line2 = "Tolerance = 20 %"
    END IF
END IF
```<br><br>*Award marks for:*<br>• Check to test for Gold giving correct tolerance<br>• Check to test for Silver giving correct tolerance<br>• Check to test for Empty String giving correct tolerance<br>• Correct indentation | 4 | If END IF missing do not give indentation mark<br><br><br><br><br><br><br>First three bullet points can be in any order, and one is likely to be implied default. |
| e | | | • Use the character code for Ω (Unicode, extended ASCII)
• And the built in code → character function/CHAR/CHR | 2 | Accept common names for the code → character functions |

Question			Answer	Mark	Guidance
	f		• There are many cases (based on the value of the same variable) • IF statements would have too many levels (of nesting) • SELECT CASE statement makes the code more readable	3	
	g	i	• The code does not follow the <u>rules</u> of the language	1	Don't accept "grammar/rules of the code"
		ii	• END FUNCTION before END SELECT	1	
		iii	• Logic error / runtime error	1	

Question			Answer	Mark	Guidance

	h		*Example:*
			<pre>Digit1 = ValueOf(ColourBand1) [1]
			Digit2 = ValueOf(ColourBand2)
			NumberOfZeros = ValueOf(ColourBand3)
			IF NumberOfZeros >= 3 THEN [2]
			   NumberOfZeros = NumberOfZeros – 3 [3]
			   Unit = "k Ω" [4]
			ELSE
			   Unit = "Ω"
			END IF
			Zeros = ""
			WHILE NumberOfZeros > 0 [5]
			   Zeros = Zeros + "0" [6]
			   NumberofZeros = NumberOfZeros – 1
			END WHILE
			OUTPUT "Resistance = " [7] & Digit1 &
			Digit2 & Zeros & Unit [8]</pre>
			
			Award marks for:
			1. Uses the function ValueOf() to obtain the numeric value of the colours
			2. Checks whether there are more than three zeros
			       And if so:
			3. ... removes three zeros
			4. ... inserts a k in the right place
			5. Use loop to construct the string of zeros ...
			6. ... by concatenating zeros
			7. Output "Resistance = " ...
			8. ... the correct sequence of the other elements
				8	Other solutions are possible.
					
					Alternative example:
					<pre>Digit1 = ValueOf(ColourBand1)
					Digit2 = ValueOf(ColourBand2)
					NumberOfZeros = ValueOf(ColourBand3)
					IF NumberOfZeros >= 3 THEN
					   NumberOfZeros = NumberOfZeros – 3
					   Unit = "k Ω"
					ELSE
					   Unit = "Ω"
					END IF
					Resistance = ((Digit1 * 10) + Digit2)
					           * 10^NumberOfZeros
					OUTPUT "Resistance = " & Resistance & Unit</pre>
					
					Several solutions possible, but all solutions should address the bullet points in some way to be correct.
					
					Accept the character Ω or an attempt to produce it using a function – the ability do this correctly has already been assessed in part (e)

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