

AS Level Computer Science

H046/01 Computing Principles

Monday 5 June 2017 - Morning

Time allowed: 1 hour 15 minutes



Do not use: • a calculator		



First name	
Last name	
Centre number	Candidate number

INSTRUCTIONS

- Use black ink.
- Complete the boxes above with your name, centre number and candidate number.
- · Answer all the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if required but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the barcodes.

INFORMATION

- The total mark for this paper is **70**.
- The marks for each question are shown in brackets [].
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- · This document consists of 16 pages.

Answer all the questions.

(a)	a) Processors following the Von Neumann Architecture use registers.				
	(i)	Describe what is meant by the term 'register'.			
		[2]			
	(ii)	Give one other feature of the Von Neumann Architecture.			
		[1]			
(b)	An	example of a register is the Accumulator (ACC).			
		e a Little Man Computer instruction that will copy the contents of the accumulator into mory when executed.			
	11101	nory when excedice.			
		[1]			
(c)	And	other register is the Program Counter (PC).			
	(i)	State what the Program Counter holds.			
		[1]			
	(ii)	Give the name of two Little Man Computer instructions that may change the contents of the Program Counter when executed.			
		1			
		2			
		[2]			

2*

A student, Dan, on a limited budget finds his computer is running slowly. He uses his computer for university work and internet browsing.
Discuss what measures can be taken to improve Dan's computer's performance. You should explain what these measures are, why they improve the performance and justify whether you would recommend them.
[9]

3 The following JavaScript has been found to crash certain web browsers.

j.toString() converts j to a string. It is the JavaScript equivalent to str(j).

(a) Complete the table below.

Line	Effect of Code	
1		[2]
2		[1]
3		
4		[1]
5	Pushes total onto a stack that holds the browser's history.	
6		

b)	Line 5 pushes total onto a stack. Define the term stack, stating why it is suited to holding a web browser's history.
	[2

- 4 A delivery company sends parcels across the UK.
 - (a) The company charges on the following basis:
 - Parcels that have a volume of less than 0.3 m³ and weigh less than 4 kg cost £5 to send.
 - All other parcels cost £20 per m³ or £2 per kg, whichever is greater.

Examples

Parcel A weighs $2.5 \, \text{kg}$, has a volume of $0.1 \, \text{m}^3$ and costs £5 to send. Parcel B weighs $6 \, \text{kg}$, has a volume of $0.2 \, \text{m}^3$ and costs £12 to send. Parcel C weighs $6 \, \text{kg}$, has a volume of $0.8 \, \text{m}^3$ and costs £16 to send.

The function getCost takes in the volume and weight of a parcel and returns the cost.

```
getCost(2.5,0.1) returns 5
getCost(6,0.2) returns 12
getCost(6,0.8) returns 16
```

function getCost(weight, volume)

Complete the pseudo-code below so that the function ${\tt getCost}$ returns the correct cost.

	• • •

endfunction

© OCR 2017 Turn over

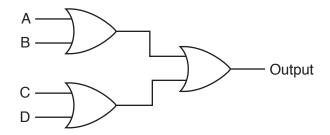
(b)		ails of customers sending parcels are stored in a database. The database contains a table ed parcel and a table called customer.
	Dra	w an entity relationship diagram showing the parcel and customer tables.
		[2]
(c)	to ta	prove parcels have not been damaged in transit, the delivery drivers use a digital camera ake a photograph of them when they arrive at their destination. The digital camera uses a memory.
	(i)	Describe one advantage of the digital camera using flash storage rather than magnetic.
		[2]
	(ii)	Explain whether lossless or lossy compression would be most appropriate to store the photographs. Justify your response.
		[3]

5 ((a)	Convert the binary number 01101111 to a hexadecimal number.	
	(b)	Convert the depart number 10 to an 2 hit number using:	1]
	(b)	Convert the denary number -19 to an 8-bit number using: (i) Two's complement representation.	
		[1]
		(ii) Sign and Magnitude representation.	
		[1]
	(c)	The two values below are stored using unsigned binary. Calculate the subtraction of 011100 from 11000011. Show your working.	10
		11000011 01110010	
			[2]
	(d)	Convert the denary number $1^{5}/_{8}$ (i.e. 1.625) to a normalised floating point binary numbusing 5 bits for the mantissa and 3 bits for the exponent. Show your working.	er
		r	31

6 (a) Draw an	XOR gate.
---------------	-----------

		[1]
(b)	Explain the difference in the function of OR and XOR gates.	
		. [2]

(c) A circuit contains the logic gates shown below.



(i) Complete the logic table below.

Α	В	С	D	Output
1	1	1	1	
1	1	1	0	
1	1	0	1	
1	1	0	0	
1	0	1	1	
1	0	1	0	
1	0	0	1	
1	0	0	0	
0	1	1	1	
0	1	1	0	
0	1	0	1	
0	1	0	0	
0	0	1	1	
0	0	1	0	
0	0	0	1	
0	0	0	0	

|--|

(ii) Complete the Boolean expression below to represent the circuit.

.....≡ Output

[2]

© OCR 2017 Turn over

10 BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

7

A company releases an Internet connected fridge. Users can email messages to the fridge and puts them on its display.	ti k
(a) The fridge uses the TCP/IP stack.	
Explain what is meant by the term 'TCP/IP stack'.	
	[3]
(b) The fridge uses the ASCII character set. Give one disadvantage of the fridge using ASC rather than Unicode.	CII
r	[41]

When the fridge receives a message it takes the string and stores it in a queue called words.

For example REMEMBER TO TAKE CHARLIE TO THE DENTIST THIS AFTERNOON becomes a queue:

```
words=["REMEMBER","TO","TAKE","CHARLIE","TO","THE","DENTIST",
"THIS","AFTERNOON"]
```

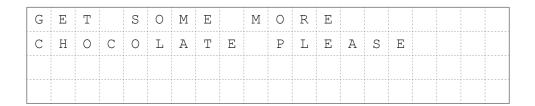
words.remove() then returns the next item in the queue
for example temp=words.remove() assigns temp the value "REMEMBER" and leaves words
as ["TO", "TAKE", "CHARLIE", "TO", "THE", "DENTIST", "THIS", "AFTERNOON"]

The display has four lines; each can show a maximum of 20 characters including spaces.

If a word can't fit on a line a new line is started.

Examples

R	Ε	М	Ε	М	В	Ε	R		Т	0		Т	А	K	Ε	1		
С	Н	А	R	L	I	Ε		Т	0		Т	Н	Ε					
D	Ε	N	Т	I	S	Т		Т	Н	Ι	S							
А	F	Т	Ε	R	N	0	0	N										



The contents of the display are stored in a 2D array of characters called display.

The procedure updateDisplay receives the queue words which holds the message and writes the message to the display.

(c) Write the procedure updateDisplay. Credit will be given for the readability of your code.

You can assume:

- Messages contain no punctuation.
- All messages will fit on the display.
- The previous message is removed before the procedure is run.

global array display[20,4]
procedure updateDisplay(words)
endprocedure

© OCR 2017 Turn over

[7]

8*	Many websites try to ensure they are accessible to all visitors regardless of disability, language spoken or the device being used to access it. Discuss the technical and design measures that can be taken to ensure a website is accessible.
	rgi

END OF QUESTION PAPER

15 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) 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.

© OCR 2017