

# Wednesday 22 June 2016 - Morning

### **A2 GCE COMPUTING**

F453/01 Advanced Computing Theory

Candidates answer on the Question Paper.

OCR supplied materials:

None

Other materials required:

· You may use a calculator

**Duration:** 2 hours



Candidate forename				Candidate surname					
Centre number	er					Candidate nu	ımber		

#### **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 120.
- 'Quality of Written Communication' will be assessed in this paper.
- This document consists of 20 pages. Any blank pages are indicated.



(a)	Оре	erating systems can use many different scheduling algorithms.	
	(i)	State three different scheduling algorithms.	
		1	
		2	
		3	
			[3]
	(ii)	Explain the purpose of scheduling.	
			[3]
(b)	Mei	mory management in a computer for main memory can use either paging or segmentation	on.
	(i)	Explain what is meant by 'paging'.	
			[2]
	(ii)	Explain what is meant by 'segmentation'.	
			[2]
	(iii)	State <b>two</b> similarities between paging and segmentation.	
		1	
		2	
			[2]

	y computers were programmed in binary machine code. Today most programmers us 1-level languages.	,0
(a)	Explain the advantage to the programmer of using a high-level language over machine cod	e.
	[	4]
(b)	Explain why the programmer could use intermediate code for the final product.	
	г	 21
(c)	Identify <b>four</b> benefits to the programmer of using library routines.	ני
	-	<b>41</b>

A co	omputer uses a Von Neumann processor.	
(a)	Describe the fetch-decode-execute cycle that this architecture uses.	
	Fetch	
	Decode	
	Execute	
4.		[3
(b)	Von Neumann architecture uses special registers to store data.	
	One of these registers is the Current Instruction Register (CIR).	
	Name <b>two</b> other special registers.	
	1	
	2	
		[2
(c)	RISC and CISC are types of processor architecture.	
	Describe the differences between the <b>two</b> architectures.	
		[4]

A real binary number may be represented in normalised floating point binary notation, using 4 bits for the mantissa followed by 3 bits for the exponent, both in two's complement binary.

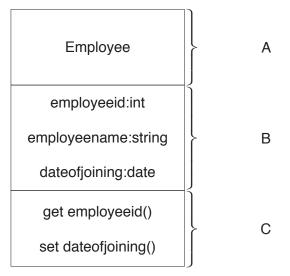
(a)	(i)	Convert the denary value 1.75 to normalised two's complement binary in the formation described.
		You must show your working.
		[4]
	(ii)	Convert the following number to denary.
		You must show your working.
		0 1 1 0 1 1 1
		ret.
		[3]

(b)	A programmer has 16 bits to use to store a real binary number.  Describe the trade-off between accuracy and range when deciding how many bits to use for the mantissa and exponent.
	[4]

	scribe the advantages and disadvantages of using a dynamic data structure.
) Par	t of the data held is as follows:
(42,	83, 27, 18, 52)
(i)	Explain why a binary search would <b>not</b> be used for this data.
(ii)	Describe the steps that a serial search would take to find the value 27.
(ii)	
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(iii) Demonstrate the steps needed for a quick sort on these values: (42, 83, 27, 18, 52).

6 A systems analyst defines part of a company's system using Unified Modelling Language (UML).



(a)	Name the three	different parts	of the diagram	labelled A, B and C.

Α	
В	
C	
_	
	I3

(b) A similar UML diagram is used to show actual data held.

Employee1
employeeid=0274
employeename=Eyhan Rajoul
dateofjoining=27022003

State the name of this type of UML.

.....[1]

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(c)	Describe the purpose of UML.
	[4]

7	A car warning system is designed using open(door) in(key) off(seat_belt) on(hand_brake)		g a declarative language.		W			
		beep(A,B) If open(A) AND in(B) beep(A,B) If off(A) AND in(B) beep(A,B) If on(A) AND in(B)	}	X				
		beep(P,Q)?	}	Υ				
		Step01 attempt to solve (P) Step02 finds P=door Step03 Set P=door Step04 finds Q=key Step05 Set Q=key Z Step06 A solution is P=door Q=key Step07 attempt to solve (P) Step08 finds P=seat_belt Step09 Set P=seat_belt Step10 finds Q=key Step11 Set Q=key						
	(a) S	State whether each letter represents a	a goal, ru	le, instantiation or fa	ct.			
	١	N						
	)	Χ						
	,	Υ						
		Z						
						[4]		
	(b) [	Describe backtracking using the next	three ste	ps: Step 12, Step 13	and Step 14.			
						[6]		

8	A company employs a systems analyst to create a program for calculating wages. The data tha
	he analyses has the following items:

- Hourly rate.
- Hours worked.
- Tax paid.
- National Insurance paid.
- (a) Describe how stepwise refinement could be used to develop this program.

A diagram should be used as part of your answer.

	[6]
(b)	The programmer given the task of doing the calculations decides to use a low-level programming language.
	Explain why reverse Polish notation would be used.
	[3]
	[0]

(c) Various variables are used in the execution of the program.

Explain the term 'scope' in relation to variables within a program that calls several different procedures.

.....[6]

9	(a)	A processor uses a number of different registers. One of these is the Current Instruction Register.
		Describe the use of special registers and their functions during the fetch-decode-execute cycle, including jump instructions, reading from and writing to memory.
		The quality of written communication will be assessed in your answer to this question.

......[8]

(b)	Symbolic addressing is used in assembly language.
	Describe symbolic addressing and why it may be used.
	[4]

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	Describe the differences between a flat file and a relational database.
	[4
(b)	A database contains three tables labelled Customer, Order and Item. Draw are Entity-Relationship Diagram for these where a Customer can have many Orders and are Order can have many Items.
	[3
(c)	[3 Part of the database was designed in SQL.
(c)	
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(d)	d) The table named Cust_File has these fields: (Cust_ID, Title, First_Name, Surn Email_Address, Age, Phone_No, Address1, Address2, County, Postcode).						
	A promotion targeting 15–18 year olds is planned.						
	(i)	State the most appropriate field that should be used as a secondary key for this promotion.					
		[1]					
	(ii)	Explain the term 'secondary' key.					
		[2]					
	(iii)	An example of SQL is given as follows:					
		SELECT (Title, First_Name, Surname, Phone_No) FROM Cust_File WHERE Age > 21 ORDER by Surname					
		Rewrite this code to select the target audience.					
		[2]					

## **END OF QUESTION PAPER**

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