

Cambridge International Examinations

Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	
COMPUTER S	CIENCE		9608/32
Paper 3 Advar	nced Theory		May/June 2018
			1 hour 30 minutes
Candidates and	swer on the Question Paper.		
No Additional N	Materials are required.		
No calculators	allowed.		

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces at the top of this page.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer all questions.

No marks will be awarded for using brand names of software packages or hardware.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

The maximum number of marks is 75.



1 Data types can be defined in a programming language.

The data type, StudentRecord, is defined by the code:

	- L	tudentRecord	
	DEC	LARE StudentID	: INTEGER
	DEC	LARE StudentFirstName	: STRING
	DEC	LARE StudentSurname	: STRING
		LARE StudentDOB	
			: ARRAY[1:10] OF STRING
ENI	TYP:		
Αv	ariab	le, CollegeStudent, is decla	ared with the code:
	DEC	LARE CollegeStudent : S	StudentRecord
(2)	\\/rit	to a psoudocodo statement to	assign 6539 to the StudentID of CollegeStudent.
(a)	VVIII	te a pseudocode statement to	assign 6559 to the Studentib of Corregestudent.
			[1]
			[1]
(h)	The	e type definition for StudentRe	ecord is changed
(~)		typo dominati for bedderrend	occurrence of an england
	(i)	Students can take six course Physics, Chemistry, Music, D	es from: Computer Science, Engineering, Science, Maths, rama and English Language.
	(i)	Physics, Chemistry, Music, D	
	(i)	Physics, Chemistry, Music, D	rama and English Language.
	(i)	Physics, Chemistry, Music, D Rewrite one line from the type	rama and English Language.
	(i)	Physics, Chemistry, Music, D Rewrite one line from the type	rama and English Language. e definition of StudentRecord to implement the change.
	(i)	Physics, Chemistry, Music, D Rewrite one line from the type DECLARE	rama and English Language. e definition of StudentRecord to implement the change.
	(i)	Physics, Chemistry, Music, D Rewrite one line from the type DECLARE	rama and English Language. e definition of StudentRecord to implement the change.
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		Physics, Chemistry, Music, D Rewrite one line from the type DECLARE	rama and English Language. e definition of StudentRecord to implement the change. [2]
	(i) (ii)	Physics, Chemistry, Music, D Rewrite one line from the type DECLARE	e definition of StudentRecord to implement the change.
		Physics, Chemistry, Music, D Rewrite one line from the type DECLARE	rama and English Language. e definition of StudentRecord to implement the change. [2]
		Physics, Chemistry, Music, D Rewrite one line from the type DECLARE The values for the field Stude Rewrite one line from the type	rama and English Language. e definition of StudentRecord to implement the change. [2] entID must be between 1 and 8000 inclusive.

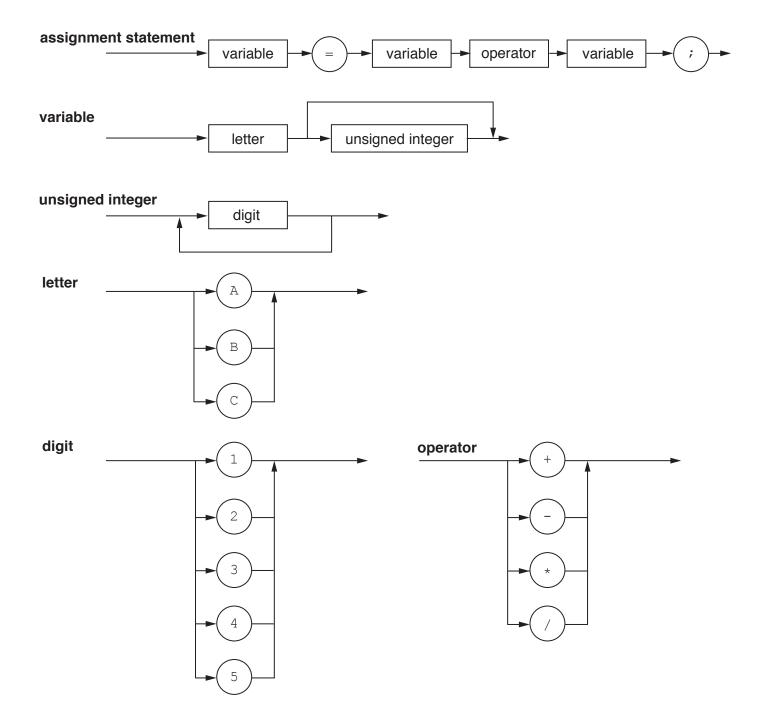
(c) A programmer is asked to write a program to process the assessment data for each student. Students sit one exam in every course they take.

A composite data type, StudentAssessment, needs to be defined with the following three fields.

- a student assessment code (a unique code of three letters and two digits)
- the marks for the six exams
- the average mark of the six exams

(i)	Write pseudocode to define the data type StudentAssessment.
	[4]
(ii)	Data about all students and their assessments are stored in a file that uses random organisation. The StudentID is used as the key field.
	The program allows a user to enter data for a new student.
	Explain how the program adds the new data to the file.
	[3]

- 2 The following syntax diagrams show the syntax of:
 - an assignment statement
 - a variable
 - an unsigned integer
 - a letter
 - a digit
 - an operator



(a)	rne	e following assignment statements are invalid.	
	Give	e the reason in each case.	
	(i)	A = B + 5;	
		Reason	
			.[1]
	(ii)	A = B - D;	
		Reason	
			.[1]
	(iii)	C4 = B2 - A1 + C3;	
		Reason	
			.[1]
(b)	Con	nplete the Backus-Naur Form (BNF) for the syntax diagrams shown on the opposite page	ge.
	<as< th=""><th>ssignment statement> ::=</th><th></th></as<>	ssignment statement> ::=	
	<va< th=""><th>ariable> ::=</th><th></th></va<>	ariable> ::=	
	<un< th=""><th>signed integer> ::=</th><th></th></un<>	signed integer> ::=	
	<op< th=""><th>perator> ::=</th><th></th></op<>	perator> ::=	
			[6]

	(c)	The syntax of variable is changed to allow one or more letters followed by an unsigninteger.	ned
		Draw a syntax diagram for the new syntax of the variable.	
			[3]
3	In a	a computer system, real numbers are stored using normalised-floating point representat n:	ion
	•	8 bits for the mantissa 4 bits for the exponent two's complement form for both mantissa and exponent.	
	(a)	Calculate the normalised floating-point representation of + 21.75 in this system. Show y working.	our
		Working	
		Mantissa Exponent	
			[0]
			[3]

(b) Find the denary value for the following binary floating-point number.

					Man	tissa	a						Expo	onen	t		
		1	0	1	1	0	0	0	0			1	1	1	0		
	Sho	w yo	ur w	orkin	g.												
	Wor	king															
	Ans	wer .															 [3]
The	TCP	//Рр	roto	col sı	uite is	use	d on	the	Interr	iet.							
(a)	The	table	e ha	s stat	emer	nts at	oout	trans	mitti	ng data a	cross th	e Inte	ernet				
	Put	a tick	⟨ (✓) in ea	ach ro	ow to	ider	ntify v	wheth	ner the re	sponsibi	lity b	elono	gs to	TCP	or IP.	
					Res	pon	sibil	ity			7	ГСР			IP		
	Co	orrec	t roı	uting													
	Н	ost to) ho	st cor	nmun	icatio	on										
	Co	omm	unic	ation	betw	een	netw	orks									
	Re	etran	smi	tting r	nissir	ng pa	cket	S									
	Re	eass	emb	ling p	acke	ts int	o the	cor	rect o	order							
																	[5]
(b)	lden	ıtif∨ t	WΩ	other	interr	net n	rotoc	ols.	State	a use fo	r each n	rotoo	ol.				
(-)		-				•											
	Llee																
	056																

		tocol 2	
		······································	
			[4]
(c)		te the name of the TCP/IP layer that uses IP addresses.	.
			[1]
(d)	Em	ails are transmitted across the Internet using packet switching and routing tables.	
	(i)	Give four items of data in an IP data packet.	
		1	
		2	
		3	
		4	[4]
	(ii)	Describe two benefits of using packet switching.	
		Benefit 1	
		Benefit 2	
			[4]
	(iii)	Give two items of data stored in a routing table.	
		1	
		2	
			[2]

5

wor	arina works for a company specialising in the sale of computer parts and accessories. She ks in the London office and her colleague Lucy works in the Hong Kong office. Katarina emails fidential information to Lucy so that only Lucy can read the information.
(a)	Explain how public and private keys are used to ensure that only Lucy has a readable copy of the confidential information.
	[4]
(b)	Julio is buying items from the online shop. He already has an account with the shop.
	Explain how the use of Secure Socket Layer (SSL) or Transport Layer Security (TLS) helps to keep Julio's confidential information secure.
	[3]
(c)	The manager of the company is concerned about the threat of malware.
	State three vulnerabilities that a malware can exploit.
	1
	2
	3
	[3]

(a) There are five scenarios on the left and two types of system on the right.

6

Scenario	System
Car speed display	
Aeroplane autopilot	
	Control
Rollercoaster	
	Monitoring
Recording the rainfall at a weather station	
Robot loading a part onto a conveyor belt	
a conveyor belt	of the water in each tank needs to be with
a conveyor belt Mary has six fish tanks. The temperature specific range.	ry can add to her tanks to help maintain
a conveyor belt Mary has six fish tanks. The temperature specific range. Identify three items of hardware that Ma temperature. Describe the purpose of each i	ry can add to her tanks to help maintain item.
Mary has six fish tanks. The temperature specific range. Identify three items of hardware that Ma temperature. Describe the purpose of each item 1	ry can add to her tanks to help maintain item.
a conveyor belt Mary has six fish tanks. The temperature specific range. Identify three items of hardware that Ma temperature. Describe the purpose of each item 1	ry can add to her tanks to help maintain item.
Mary has six fish tanks. The temperature specific range. Identify three items of hardware that Ma temperature. Describe the purpose of each item 1	ry can add to her tanks to help maintain item.
Mary has six fish tanks. The temperature specific range. Identify three items of hardware that Ma temperature. Describe the purpose of each item 1	ry can add to her tanks to help maintain item.
Mary has six fish tanks. The temperature specific range. Identify three items of hardware that Ma temperature. Describe the purpose of each item 1	of the water in each tank needs to be with ary can add to her tanks to help maintain item.

(c) A temperature reading is taken from each tank once per minute. The temperature reading is stored as two successive bytes. The format is shown:

			Fish	tank	(Temperature reading
7	6	5	4	3	2	1	0	
			Ву	te 1				Byte 2
								d by setting one of the bits in Byte 1 to 1. For example, fisl tting bit 5 to 1.
	Bit 7	of B	yte 1	is a	flag:			
								zero been processed, the flag's value is set to 1
	Bit 0	of B	yte 1	is u	nuse	d.		
	Byte	2 cc	ntair	ns the	e tem	pera	ture	reading as a two's complement integer.
	(i)	After	a te	mper	ature	e rea	ding	has been taken, the bytes contain the following data.
7	6	5	4	3	2	1	0	
0	0	0	0	1	0	0	0	0 0 0 0 1 0 1 1
			Ву	te 1				Byte 2
		Anal	yse t	he da	ata c	ontai	ned	in the two bytes.

(ii)	The system receives a temperature reading of -2 from fish tank number 4.
	Complete the bytes to show the values for this reading after it has been processed.

7	6	5	4	3	2	1	0
			<u> </u>				
			By	te 1			

(d) A hardware device to affect the temperature of each tank is on or off depending on the value of a bit in memory location 6753.

[2]

If bit 4 is 1, then the hardware device in fish tank 4 is on.

Write assembly language instructions to set bit 4 of memory location 6753 to 1 wit changing any other bits. Use the instruction set provided.	hout
	[3]

Instruction set

Instruction		Explanation
Op code	Operand	
LDD	<address></address>	Direct addressing. Load the contents of the location at the given address to ACC.
STO	<address></address>	Store the contents of ACC at the given address.
AND	#n	Bitwise AND operation of the contents of ACC with the operand.
AND	<address></address>	Bitwise AND operation of the contents of ACC with the contents of <address>.</address>
XOR	#n	Bitwise XOR operation of the contents of ACC with the operand.
OR	#n	Bitwise OR operation of the contents of ACC with the operand.
OR	<address></address>	Bitwise OR operation of the contents of ACC with the contents of <address>. <address> can be an absolute address or a symbolic address.</address></address>

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