

Cambridge International Examinations

Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		



COMPUTER SCIENCE

9608/12

Paper 1 Theory Fundamentals

May/June 2015

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional 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.



(i)	Convert	the follo	wing bina	ry numbe	er into he	xadecim	al.		
				1	0111	000			
								 	[1]
(ii)	Convert	the follo	wing dena	ary numb	er into B	CD forma	at.		
					9 7	•			
									[1]
(iii)	Using tw		plement,	show how					red in an 8-bit
	114								
									'
	- 93								
					1		1		[2]

2

(a) So	ound can be represented in a computer in a digital format.	
(i)		
		[1]
(ii)	Give one reason why 16-bit sampling is used in an audio compact disc (CD).	
(iii)	Explain what is meant by the term sampling resolution.	
		[2]
(iv)	Give one benefit and one drawback of using a higher sampling resolution.	
	Benefit	
	Drawback	
		[2]
(b) De	escribe two typical features found in software for editing sound files.	
1.		
2 .		
		[2]

c)	Explain the difference between <i>lossless</i> and <i>lossy</i> data compression techniques.						
		•••••					
		[2					

3 Five modes of addressing and five descriptions are shown below.

Draw a line to connect **each** mode of addressing to its correct description.

Mode of addressing **Description** the operand is the address of the direct address of the value to be used the operand is the address of the value immediate to be used the operand is the offset from the indexed current address where the value to be used is stored the operand plus the contents of the indirect index register is the address of the value to be used relative the operand is the value to be used

[4]

(a)	Ser	nsors are one type of input device.
	For	each of the following situations, name a different sensor that could be used.
	(i)	air conditioning in an office building
		[1]
	(ii)	maintaining correct growing conditions in a greenhouse
		[1]
	(iii)	detecting an intruder in a building
		[1]
(b)		nsors are used to monitor seismic activity. At the end of each day, all the data are ismitted to a central computer. This is hundreds of kilometres away.
	Des staç	scribe one way of ensuring that the integrity of the data is retained during the transmission ge.
		[4 _]

- 5 (a) Telephone calls can be made by using:
 - conventional telephones (using the Public Service Telephone Network (PSTN) system) over a wired network
 - a computer, equipped with speakers and microphone, connected to the Internet

Put a tick (\checkmark) in the correct column to match each description to the appropriate communication method.

Description	Conventional telephone using PSTN	Internet-based system
connection only in use whilst sound is being transmitted		
dedicated channel used between two points for the duration of the call		
connection maintained throughout the telephone call		
encoding schemes and compression technology used		
lines remain active even during a power outage		

b)	Distinguish between the Internet and the World Wide Web (WWW).	
	_	
	Ţ,	٦.

[5]

(c)	Nan	ne the hardware device that is being described:
	(i)	A device that transfers data from one network to another in an intelligent way. It has the task of forwarding data packets to their destination by the most efficient route.
		[1]
	(ii)	A device used between two dissimilar LANs. The device is required to convert data packets from one protocol to another.
		[1]
((iii)	A device or software that provides a specific function for computers using a network. The most common examples handle printing, file storage and the delivery of web pages.
		[1]

6 (a) Name the most suitable input or output device for each of the following uses.

Give a different device in each case.

Description of use	Input or output device
input of credit card number into an online form	
selection of an option at an airport information kiosk	
output of a single high-quality photograph	
output of several hundred high-quality leaflets	
input of a hard copy image into a computer	

Inp	ut of	a nard copy image into a computer	
		[!	5]
(b)	All	of the uses in part (a) involve the input or output of data.	
	(i)	Describe two methods of preventing accidental loss of data.	
		1	
		2	
		[2	2]
	(ii)	Describe one way of ensuring the security of the data against malicious damage.	
			••
			1]

7 A system is monitored using sensors. The sensors output binary values corresponding to physical conditions, as shown in the table:

Parameter	Description of parameter	Binary value	Description of condition
Р	oil pressure	1	pressure >= 3 bar
	on pressure	0	pressure < 3 bar
_	tomporatura	1	temperature >= 200°C
, I	temperature	0	temperature < 200°C
R	rotation	1	rotation <= 1000 revs per minute (rpm)
"	Totation	0	rotation > 1000 revs per minute (rpm)

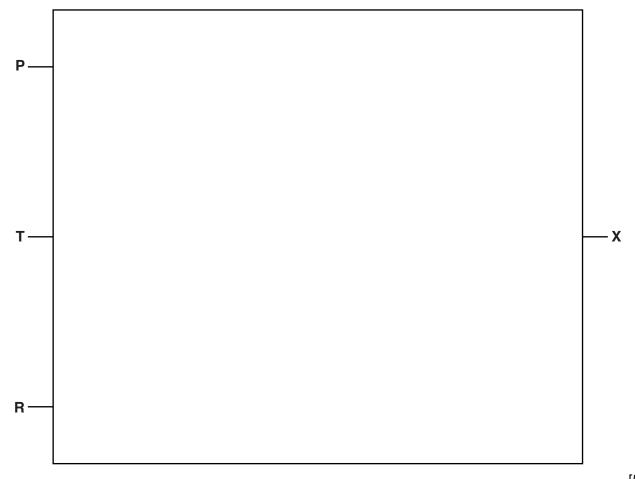
The outputs of the sensors form the inputs to a logic circuit. The output from the circuit, X, is 1 if any of the following three conditions occur:

either oil pressure >= 3 bar and temperature >= 200°C

or oil pressure < 3 bar and rotation > 1000 rpm

or temperature >= 200°C and rotation > 1000 rpm

(a) Draw a logic circuit to represent the above system.



(b) Complete the truth table for this system.

			Workspace	
Р	Т	R	•	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

(a)	Explain how the width of the data bus and system clock speed affect the computer system.	e performance	of a
	Width of the data bus		
	Clock speed		
(b)	Most computers use Universal Serial Bus (USB) ports to allow the attachm		
	Describe two benefits of using USB ports.		
	1		
	2		
(-)	The table change six stories in the van Neumann fatale avecute avala		[2]
(C)	The table shows six stages in the von Neumann fetch-execute cycle.		
	Put the stages into the correct sequence by writing the numbers 1 to 6 column.	in the right h	nanc
	Description of stage	Sequence number	
the	instruction is copied from the Memory Data Register (MDR) and placed		

Description of stage	Sequence number
the instruction is copied from the Memory Data Register (MDR) and placed in the Current Instruction Register (CIR)	
the instruction is executed	
the instruction is decoded	
the address contained in the Program Counter (PC) is copied to the Memory Address Register (MAR)	
the value in the Program Counter (PC) is incremented so that it points to the next instruction to be fetched	
the instruction is copied from the memory location contained in the Memory Address Register (MAR) and is placed in the Memory Data Register (MDR)	

Question 9 begins on page 14.

9 A database has been designed to store data about salespersons and the products they have sold.

The following facts help to define the structure of the database:

- each salesperson works in a particular shop
- each salesperson has a unique first name
- each shop has one or more salespersons
- each product which is sold is manufactured by one company only
- each salesperson can sell any of the products
- the number of products that each salesperson has sold is recorded

The table ShopSales was the first attempt at designing the database.

FirstName	Shop	ProductName	NoOfProducts	Manufacturer
Nick	TX	television set refrigerator digital camera	3 2 6	SKC WP HKC
Sean	ВН	hair dryer electric shaver	1 8	WG BG
John	TX	television set mobile phone digital camera toaster	2 8 4 3	SKC ARC HKC GK

(a)	State why the table is not in First Normal Form (1NF).
	[1]

(b) The database design is changed to:

SalesPerson (FirstName, Shop)

SalesProducts (FirstName, ProductName, NoOfProducts, Manufacturer)

Using the data given in the first attempt table (ShopSales), show how these data are now stored in the revised table designs.

Table: SalesPerson

FirstName	Shop

Table: SalesProducts

FirstName	ProductName	NoOfProducts	Manufacturer
	<u>I</u>	I.	

(c) (i)	A relationship between the two tables has been implemented.		
	Explain how this has been done.		
410	[2]		
(ii)	Explain why the SalesProducts table is not in Third Normal Form (3NF).		
	[2]		
(iii)			
	[2]		

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

Cambridge International Examinations 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.