Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

0276230714

COMPUTER SCIENCE **9608/13**

Paper 1 Theory Fundamentals **May/June 2016**

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 on all the work you hand in.
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.

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1 Describe **two** differences between a compiler and interpreter.

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.....[4]

2 **(a)** Convert the following 8-bit binary integer into denary.

01001101

.....[1]

(b) Convert the following denary number into Binary Coded Decimal (BCD).

82

.....[1]

(c) Convert the following two's complement integer number into denary.

11001011

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.....[2]

(d) Convert the following denary number into hexadecimal. Show your working.

198

.....[2]

3 A company needs new software to manage its accounts. It is evaluating two different options. One option is open source software and the other is commercial software.

(a) Explain what is meant by open source software.

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(b) Explain what is meant by commercial software.

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(c) The company has decided to purchase commercial software.

Identify **four** benefits to the company in choosing the commercial software option.

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3 .....

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4 .....

.....[4]

Question 4 begins on page 5.

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4 The table shows assembly language instructions for a processor which has one general purpose register, the Accumulator (ACC) and an index register (IX).

Instruction		**Explanation**
Op code	**Operand**	
LDD	<address>	Direct addressing. Load the contents of the given address to ACC.
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC.
STO	<address>	Store contents of ACC at the given address.
ADD	<address>	Add the contents of the given address to ACC.
INC	<register>	Add 1 to the contents of the register (ACC or IX).
DEC	<register>	Subtract 1 from the contents of the register (ACC or IX).
CMP	<address>	Compare contents of ACC with contents of <address>.
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True.
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False.
JMP	<address>	Jump to the given address.
OUT		Output to screen the character whose ASCII value is stored in ACC.
END		Return control to the operating system.

The diagram shows the contents of the index register:

Index register:

1	1	0	0	1	1	0	1

(a) Show the contents of the index register after the execution of the instruction:

```
INC IX
```

Index register:

[1]

(b) Complete the trace table on the opposite page for the following assembly language program.

20	LDX 90
21	DEC ACC
22	STO 90
23	INC IX
24	LDX 90
25	DEC ACC
26	CMP 90
27	JPE 29
28	JPN 31
29	ADD 90
30	OUT
31	ADD 93
32	STO 93
33	OUT
34	END
⋮	
90	2
91	90
92	55
93	34

IX	2

Selected values from the ASCII character set:

ASCII Code	65	66	67	68	69	70	71	72
Character	A	B	C	D	E	F	G	H

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Trace table:

Instruction	Working space	ACC	Memory address				IX	OUTPUT
			90	91	92	93		
			2	90	55	34	2	
20								
21								
22								
23								
24								
25								
26								

[7]

5 **(a)** A Database Management System (DBMS) provides the following features.

Draw a line to match each feature with its description.

Feature	Description
Data dictionary	A file or table containing all the details of the database design
Data security	Data design features to ensure the validity of data in the database
Data integrity	A model of what the database will look like, although it may not be stored in this way
	Methods of protecting the data including the uses of passwords and different access rights for different users of the database

[3]

A school stores a large amount of data that includes student attendance, qualification and contact details. The school is setting up a relational database to store these data.

(b) The school needs to safeguard against any data loss.

Describe **three** factors to consider when planning a backup procedure for the data.

Justify your decisions.

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2 .....

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3 .....

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.....[6]

(c) The database design has three tables to store the qualifications and grades each student has attained. The following is a sample of the data from each table.

STUDENT

StudentID	FirstName	LastName	Tutor
001AT	Ahmad	Tan	11A
003JL	Jane	Li	11B
011HJ	Heather	Jones	10A

QUALIFICATION

QualCode	Level	Subject
CS1	IGCSE	Computer Science
MT9	IGCSE	Maths
SC12	IGCSE	Science

STUDENT-QUALIFICATION

QualCode	StudentID	Grade	DateOfAward
SC12	011HJ	A	31/8/2014
SC12	003JL	C	31/8/2014
CS1	003JL	B	31/8/2014

(i) Draw an Entity-Relationship (E-R) diagram to show the relationships between these three tables.

[2]

(ii) State the type of relationship that exists between `STUDENT` and `STUDENT-QUALIFICATION`.

.....[1]

(iii) Describe how the relationship between `QUALIFICATION` and `STUDENT-QUALIFICATION` is implemented.

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(d) (i) The database will store each student's date of birth.

Write an SQL script to add a date of birth attribute to the appropriate table.

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(ii) Write an SQL script to display the `StudentID`, `Grade` and `DateOfAward` for the `QualCode` value of SC12.

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(iii) Write an SQL script to display the `FirstName` and `LastName` and `QualCode` for all `STUDENT-QUALIFICATION`s for which the `Grade` value is A.

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.....[4]

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6 **(a)** Explain the difference between the World Wide Web (WWW) and the Internet.

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.....[2]

(b) Three methods of connecting devices include fibre-optic cables, copper cables and radio waves. The table below gives descriptions relating to these connection methods.

Tick (✓) one box on each row to show the method that best fits each description.

Description	Fibre-optic cable	Copper cable	Radio waves
Wireless medium			
Twisted-pair is an example			
Uses light waves			
WiFi			
Fastest transmission medium			

[5]

(c) Bit streaming is used for both real-time and on-demand services.

Describe **one** difference between real-time and on-demand bit streaming.

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.....[2]

(d) A device needs an IP address to connect to the Internet. IPv4 is the more common type of IP address.

Describe, using an example, the format of an IPv4 address.

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.....[3]

(e) A computer user keys in the Uniform Resource Locator (URL) of a web page into a web browser.

Describe how the browser uses the Domain Name Service (DNS) to display the web page.

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.....[4]

7 A bank holds personal data about its customers and their financial data.

(a) Describe the difference between security and integrity of data.

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.....[4]

(b) Describe **three** security measures that the bank could implement to protect its electronic data.

Security measure 1 .....

Description .....

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Security measure 2 .....

Description .....

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Security measure 3 .....

Description .....

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.....[6]

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