Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

COMPUTER SCIENCE **9608/11**

Paper 1 Theory Fundamentals **October/November 2020**

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use an HB pencil for any diagrams, graphs or rough working.
- Calculators must **not** be used in this paper.

INFORMATION

- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].
- No marks will be awarded for using brand names of software packages or hardware.

This document has **16** pages. Blank pages are indicated.

[Turn over

1 Draw **one or more** lines to link each language translator to the most appropriate statement(s).

Language translator	Statements
	Converts a low-level language instruction into binary
	Stops as soon as it finds a syntax error
Compiler	Needs the source code to be present when the user's program is run
	Reports all errors found at the end of the process
	Corrects syntax errors as they are detected
Interpreter	Converts a high-level language into a different form
	Creates an executable file

[3]

2 A veterinary surgery cares for sick animals. The surgery has a file-based database that stores data about the pets, their owners, and appointments made with the surgery.

The surgery wants to upgrade to a relational database.

(a) Explain the reasons why the surgery should upgrade their database.

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..... [4]

(b) The design for the surgery database, `SURGERY`, is:

```
PET(PetID, OwnerFirstName, OwnerLastName, PetName, PetBreed,
    PetDateOfBirth, TelephoneNumber)

APPOINTMENT(AppointmentID, Date, Time, StaffID, PetID)
```

(i) Give **one** reason why the database design for `SURGERY` is **not** in Third Normal Form (3NF).

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..... [1]

(ii) The database needs to be normalised to 3NF. A pet may have more than one owner and an owner may have more than one pet.

The appointment table does not need to change and has been repeated below.

Give the name **and** attributes of three **additional** tables in 3NF. Identify the primary key(s) in each table.

APPOINTMENT(AppointmentID, Date, Time, StaffID, PetID)

Table 1 .....

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Table 2 .....

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Table 3 .....

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[4]

(c) Part of the table APPOINTMENT is shown. The veterinary surgery uses Data Manipulation Language (DML) statements to search for appointments.

AppointmentID	Date	Time	StaffID	PetID
222010	02/02/2021	12:40	JK1	20CF
222011	02/02/2021	12:40	PP2	10DT
222012	02/02/2021	12:50	JK1	9RR
222013	02/02/2021	13:00	JK1	7MR

(i) Identify the industry standard language that provides both DML and Data Definition Language (DDL) statements.

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..... [1]

(ii) Write a DDL statement to update the table `APPOINTMENT` and define `AppointmentID` as the primary key.

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..... [2]

(iii) Complete the DML script to display the times and Pet IDs of all appointments on 02/02/2021 with staff ID of 'JK1', in descending order of time.

```
SELECT ..... , .....

FROM APPOINTMENT

WHERE ..... AND .....

ORDER BY Time ..... ;
```

[3]

(d) New pet owners complete a paper-based form to register their pets at the surgery.

(i) Describe **two** verification checks that can be carried out when the data from the paper-based form is entered into the database.

1 .....

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2 .....

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[4]

(ii) Appointments can be booked between 09:00 and 16:50 on Monday to Friday.

Describe the ways in which the appointment date and time can be validated to make sure they are reasonable.

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..... [2]

(e) The surgery has five computers that can all access the database. A copy of the database is stored centrally.

(i) Complete the description of this type of network model by filling in the missing terms.

The ..... model has one ..... that stores all the data for the surgery. The other computers are ..... . When a user requests data, a request is sent to the ..... .

[4]

(ii) The surgery wants to keep all data secure. The surgery network is not connected to the Internet.

Identify **two** authentication techniques the surgery could use to restrict access to the data.

1 .....

2 .....

[2]

3 Ria manages a team of software developers. The team is creating a mobile application game for a client.

Ria wants to ensure that her team works to the ACM/IEEE Software Engineering Code of Ethics.

(a) Explain the ways in which Ria and her team can ensure that they follow the Code of Ethics in relation to the product and their colleagues.

(i) Product

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..... [2]

(ii) Colleagues

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..... [2]

(b) Ria's client wants to sell the game for a profit. The client cannot decide which type of software licence to use to distribute the game.

Identify **two** types of licence that Ria could recommend to her client **and** justify the use of each licence.

Licence 1 .....

Justification .....

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Licence 2 .....

Justification .....

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[4]

4 The following table shows assembly language instructions for a processor that has one general purpose register, the Accumulator (ACC).

Instruction		Explanation
Op code	**Operand**	
LDD	<address>	Direct addressing. Load the contents of the location at the given address to ACC.
LDM	#n	Immediate addressing. Load the denary number n to ACC.
LDI	<address>	Indirect addressing. The address to be used is at the given address. Load the contents of this second address to ACC.
CMP	<address>	Compare the contents of ACC with <address>.
STO	<address>	Store contents of ACC at the given address.
ADD	<address>	Add the contents of the given address to ACC.
SUB	<address>	Subtract the contents of the given address from the contents of ACC.
OUT		Output to screen the character whose ASCII value is stored in ACC.
INC	<register>	Add 1 to the contents of the register (ACC or IX).
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True.
END		Return control to the operating system.

(a) The current contents of the main memory are:

Address	Instruction
100	LDD 200
101	ADD 201
102	ADD 202
103	SUB 203
104	STO 204
105	END
...	
200	10
201	20
202	5
203	6
204	
205	

Tick (✓) **one** box to indicate which **one** of the following statements is **true** after program execution.

Statements	Tick (✓)
Memory location 204 contains `400`	
Memory location 204 contains `41`	
Memory location 204 contains `231`	
Memory location 204 contains `29`	

[1]

(b) The current contents of the main memory are:

Address	Instruction
100	`LDM #120`
101	`ADD 121`
102	`SUB 122`
103	`STO 120`
104	`END`
…	
120	`10`
121	`2`
122	`4`
123	`6`
124	`8`
125	`10`

Tick (✓) **one** box to indicate which **one** of the following statements is **true** after program execution.

Statement	Tick (✓)
Memory location 120 contains `135`	
Memory location 120 contains `118`	
Memory location 120 contains `0`	
Memory location 120 contains `16`	

[1]

[Turn over

(c) The current contents of the main memory are:

Address	Instruction
150	LDI 200
151	ADD 200
152	ADD 201
153	STO 205
154	END
…	
200	202
201	203
202	201
203	200
204	
205	

Tick (✓) **one** box to indicate which **one** of the following statements is **true** after program execution.

Statement	Tick (✓)
Memory location 205 contains 607	
Memory location 205 contains 601	
Memory location 205 contains 603	
Memory location 205 contains 606	

[1]

(d) Identify **two** modes of addressing that are **not** used in **parts (a)**, **(b)** or **(c)**.

1 .....

2 .....

[2]

(e) Assembly language instructions can be put into groups.

Tick (✓) **one** box on each row to indicate the appropriate instruction group for each assembly language instruction.

Assembly language instruction	Arithmetic	Data movement	Jump instruction	Input and output of data
`STO 120`				
`JPE 200`				
`ADD 3`				
`LDD 20`				
`INC ACC`				
`OUT`				

[3]

5 Oscar is watching a concert on his laptop computer.

(a) The concert is streamed to his computer at the same time as it is taking place.

(i) Identify whether Oscar is using real-time or on-demand bit streaming. Justify your choice.

Streaming method .....

Justification .....

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[3]

(ii) The video of the concert repeatedly stops and restarts while Oscar is watching it on his laptop computer. His friend is watching the same video of the concert at the same time, in a different location, but he does not experience the same problem as Oscar.

Give **three** possible reasons why Oscar's video constantly stops and starts again.

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2 .....

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3 .....

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[3]

(b) The video of the concert is made up of a sound track and multiple images.

Two successive frames of one section of the video are shown. The pixel colours are represented by letters.

BL	BL	BL	RD	RD	RD
K	K	K	K	K	K
LG	LG	LG	DG	DG	DG
Y	Y	K	Y	Y	K
W	K	W	W	W	DG
P	P	P	P	P	P

Frame 1

BL	BL	BL	RD	RD	RD
BL	BL	BL	RD	RD	RD
LG	LG	LG	DG	DG	DG
BK	BK	BK	BK	BK	BK
W	K	W	W	W	DG
P	P	P	P	P	P

Frame 2

(i) Explain the way in which progressive encoding can be used to transmit Frames 1 and 2.

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..... [2]

(ii) Explain, using Frames 1 and 2 as an example, the way in which temporal redundancy can be used to compress a video.

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..... [3]

(iii) Give another type of redundancy technique that can be used to compress a video.

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..... [1]

(iv) MP4, WMV and AVI are all examples of a type of format that combines sound and image components into a video.

Identify the type of format that combines the sound and image components into a video.

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..... [1]

[Turn over

6 **(a)** Convert the following denary number into a 12-bit two's complement binary form.

−245

[1]

(b) Convert the following hexadecimal number into denary.

F0

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..... [1]

(c) Convert the following unsigned binary integer into denary.

10101111

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..... [1]

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

100001010011

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..... [1]

7 Anne is downloading a sound file from a web server. She had the choice of a sampling rate of 44.1 kHz or 98 kHz before she downloaded the sound file.

Explain the differences between the two sound files stored on the server.

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..... [4]

8 Joshua's laptop is connected to the router on his home network.

(a) The laptop has a private IP address. The router has both public and private IP addresses.

Explain the reasons why Joshua's laptop has a private IP address only, but the router has both a private and a public IP address.

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..... [4]

(b) Joshua visits a website by entering its Uniform Resource Locator (URL).

Describe how the URL is converted into a matching IP address.

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..... [3]

(c) Give **one** example of a valid IPv4 address.

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..... [1]