



Cambridge International AS & A Level

CANDIDATE
NAME

Model Answers

CENTRE
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COMPUTER SCIENCE

9608/12

Paper 1 Theory Fundamentals

May/June 2020

1 hour 30 minutes

You must answer on the question paper.

No additional materials are needed.

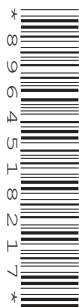
INSTRUCTIONS

- 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.



1 Samira is creating an interactive, multimedia presentation for the entrance to her hotel.

(a) The presentation will be on a device that has a resistive touchscreen for user input.

Complete the following paragraph about the basic operation of a resistive touchscreen.

The resistive touchscreen has two layers witha gap between the layers. When a finger touches the screen, thetop layer moves to touch thebottom layer; this creates a point of contact.

Thehorizontal andvertical position of this point is calculated.

[4]

(b) Samira uses a computer to draw a logo for her hotel and saves it as a vector graphic. The logo will be placed on the multimedia presentation and elsewhere, such as on signs at the entrance of the hotel.

Samira emails the logo to a company that prints signs, and other documentation for the hotel.

(i) Describe how the logo is represented by the computer.

A vector graphic has a series of geometric shapes like lines and objects...

The coordinates of these shapes are stored.

It also has a list of all the drawings and commands to draw each shape.....

.....
.....
.....
..... [3]

(ii) State **two** reasons why the hotel **logo** is saved as a vector graphic instead of a bitmapped graphic.

1 To display the logo, it needs to be large. A vector graphic when enlarged does not get pixelated and retains the original quality.

2 Vector graphics files are smaller than bitmap files. Therefore Samira can save storage space as the logo is used in many documents.

[2]

2 Amir has created a sound file using his desktop computer.

(a) Complete the table by writing the missing definitions and term about sound.

Term	Definition
Sampling	<p>Recording of the amplitude of an analogue sound wave signal at regular intervals</p> <p>.....</p> <p>.....</p> <p>.....</p>
<p>Sampling rate</p> <p>.....</p> <p>.....</p>	<p>The number of samples per unit time</p>
Sampling resolution	<p>The number of bits used to store each sample</p> <p>.....</p> <p>.....</p> <p>.....</p>

[3]

(b) The file is too large to be emailed and the file size needs to be reduced.

(i) Name **one** lossless compression technique that can be used to reduce the size of the sound file.

Run-length encoding can be used to reduce the sound file size

.....

..... [1]

(ii) Describe **one** lossy compression technique that can be used to reduce the size of the sound file.

By reducing the sampling rate, the file size can be reduced. It is done by taking fewer samples per second.

.....

..... [2]

(c) Amir’s computer has system software, including utility software and an operating system.

(i) Explain how the disk formatter, disk contents analysis and disk repair utilities work together.

The disk formatter deletes all the files on a used disk or prepares a new disk for use.

The disk contents analysis is a check for errors on a hard disk.

The disk repair fixes any errors found on the disk.

[3]

(ii) Amir’s computer has several peripheral devices connected to it.

State **three peripheral** management tasks performed by the operating system.

Task 1 The operating system installs the device driver software needed for each peripheral.

Task 2 It manages interrupts received from the peripherals.

Task 3 It also sends control signals to the peripheral devices.

[3]

(iii) The peripheral devices are plugged into USB ports of the computer.

Describe **two** benefits of connecting the peripheral devices using a USB port.

1 By connecting via a USB port, Amir can transmit data at a fast rate, which will be useful when he transfers big files such as video files.

2 Since most of the USB devices offer plug-and-play capability, it is not necessary to install device drivers.

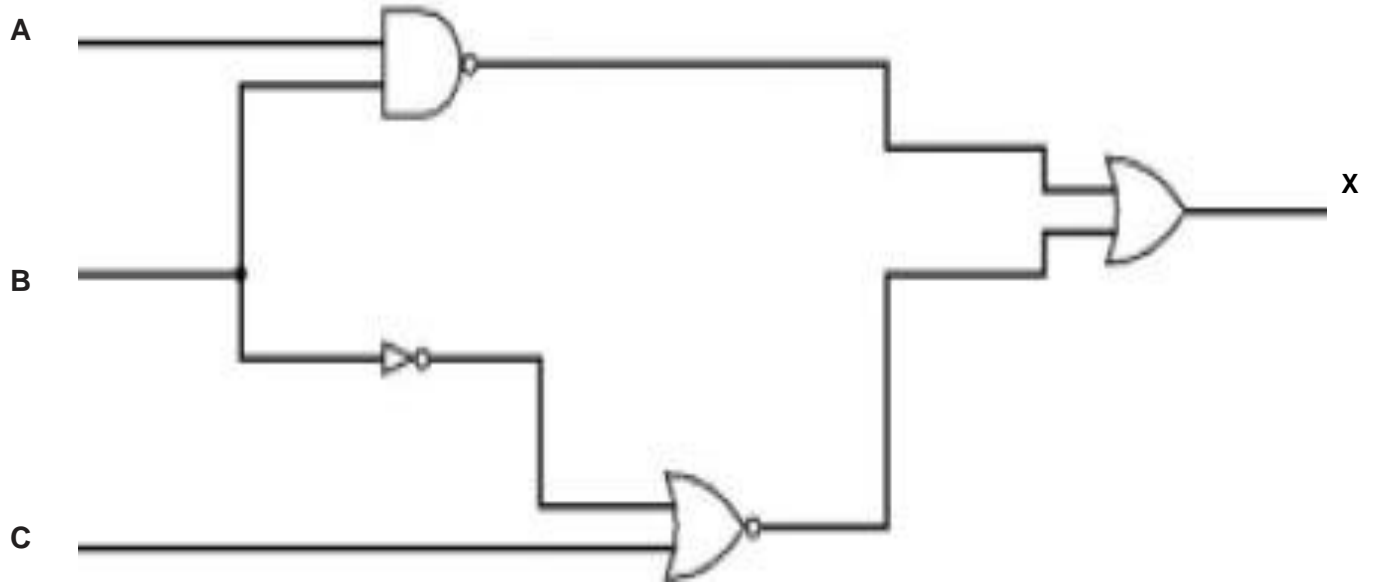
[4]

3 The following is a logic expression.

$$X = \text{NOT } (A \text{ AND } B) \text{ OR NOT } (\text{NOT } B \text{ OR } C)$$

Draw the logic circuit for the given expression using a maximum of **four** gates.

[Answer]



[4]

4 Sophie is about to start a new job as a junior software developer.

(a) She is worried about joining a new team of people.

(i) State **one ethical** action that Sophie can take to help her to feel more confident about starting work.

In order to feel confident, Sophie can read and have a good idea of the programming languages she will be using..... [1]

(ii) State **two ethical** actions that Sophie’s manager can take to help Sophie to feel more confident about starting work.

1 The manager can introduce Sophie to the team in order to make her feel comfortable at work.....

2 Also assign a mentor to support and train Sophie.....

[2]

(iii) State **one ethical** action that Sophie’s new colleagues can take to help Sophie to feel more confident about starting work.

The team can invite Sophie to a social gathering to get to know each other, before starting work..... [1]

(b) Explain why Sophie is asked to sign a professional code of conduct before starting work.

It is for Sophie to confirm that she understands the company's rules and regulations. To make Sophie understands that there could be consequences for certain actions or omissions. To make sure all employees follow the same standards.

[3]

5 (a) The steps 1 to 6 describe the first pass of a two- pass assembler.

The following three statements are used to complete the sequence of steps.

A	If it is already in the symbol table, it checks to see if the absolute address is known
B	When it meets a symbolic address, it checks to see if it is already in the symbol table
C	If it is known, it is entered

Write one of the letters **A**, **B** or **C** in the appropriate step to complete the sequence.

1. The assembler reads the assembly language instructions
2. **B**
3. If it is not, it adds it to the symbol table
4. **A**
5. **C**
6. If it is not known, it is marked as unknown.

[2]

(b) The assembler translates assembly code into machine code.

The table shows the denary values for three assembler op codes.

Op code	Denary value
LDD	194
ADD	200
STO	205

(i) Convert the denary value for the op code LDD into 8- bit binary.

[Answer]

1	1	0	0	0	0	1	0
---	---	---	---	---	---	---	---

[1]

(ii) Convert the denary value for the op code STO into hexadecimal.

CD

..... [1]

(iii) State why the denary value for the op code ADD cannot be represented in 8- bit two's complement form. Justify your answer.

8 bit two's complement binary number has to be in the range -128 to +127

Given denary value 200 is outside the allowed range.

.....

.....

..... [2]

- (c) The table shows part of the instruction set for a processor. The processor has one general purpose register, the Accumulator (ACC), and an Index Register (IX).

Instruction		Explanation
Op code	Operand	
LDM	#n	Immediate addressing. Load the denary number n to ACC
LDD	<address>	Direct addressing. Load the contents of the location at 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
LDR	#n	Immediate addressing. Load the denary number n to IX
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)
CMP	<address>	Compare contents of the address given with the contents of ACC
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

Complete the trace table for the following assembly language program. The first instruction has been completed for you.

Address	Instruction
20	LDD 103
21	CMP 101
22	JPE 30
23	LDD 100
24	ADD 101
25	STO 100
26	LDD 103
27	INC ACC
28	STO 103
29	JMP 20
30	END
...	
100	1
101	2
102	3
103	0

Instruction address	ACC	Memory address			
		100	101	102	103
		1	2	3	0
20	0				
21					
22					
23	1				
24	3				
25		3			
26	0				
27	1				
28					1
29					
20	1				
21					
22					
23	3				
24	5				
25		5			
26	1				
27	2				
28					2
29					
20	2				
21					
22					
30					

- 6 A software development company has a relational database, SOFTWARE_MANAGEMENT. The database stores details of the customers who have purchased software, as well as the software and licences that customers have purchased.

The SOFTWARE_MANAGEMENT database has the following tables:

CUSTOMER_DETAILS (CustomerID, CompanyName, Address1, Address2, City)

SOFTWARE_PURCHASED (SoftwareName, SoftwareDescription, CustomerID,
LicenceType, LicenceCost, RenewalDate)

- (a) Explain why this database is **not** in Third Normal Form (3NF). Refer to the tables in your answer.

Do **not** attempt to normalise the tables.

There are partial dependencies in the SOFTWARE_PURCHASED table.

SoftwareDescription is dependent only on SoftwareName.

There is a non-key dependency in the SOFTWARE_PURCHASED table.

LicenceCost is dependent on LicenceType.

.....
.....
..... [2]

- (b) Give an example from the database SOFTWARE_MANAGEMENT for each of the following database terms.

Term	Example
Entity	CUSTOMER_DETAILS
Foreign key	CustomerID in SOFTWARE_PURCHASED table
Attribute	CompanyName in CUSTOMER_DETAILS table

[3]

- (c) The company also develops computer games. They extend the relational database SOFTWARE_MANAGEMENT by adding a new table. The new table, GAME_DEVELOPMENT, stores details about the games and the software development teams creating them.

The table shows example data in GAME_DEVELOPMENT.

GameName	Genre	TeamNumber	DevelopmentStage	ManagerID
Bunny Hop	Platform	4	Analysis	23KP
Fried Eggs	Retro	2	Programming stage 1	9RTU
Create-a-game	Action	1	Acceptance testing	11TF

- (i) Complete the Data Definition Language (DDL) statement to create the table GAME_DEVELOPMENT. CREATE

```

.....TABLE GAME_DEVELOPMENT..... (
    GameName VarChar,
    Genre VarChar,
    TeamNumber Integer
    ..... ,
    DevelopmentStage VarChar,
    ManagerID VarChar,
    PRIMARY KEY
    ..... (GameName)
);

```

[5]

- (ii) Another table, PRODUCT_MANAGER, is created.

```
PRODUCT_MANAGER(ManagerID, FirstName, LastName)
```

Complete the Data Manipulation Language (DML) statement to return the game name, genre and team number of all games managed by the product manager with the first name 'James' and the last name 'Fitz'.

```

.....SELECT..... GameName, Genre, TeamNumber
FROM GAME_DEVELOPMENT, PRODUCT_MANAGER
WHERE PRODUCT_MANAGER.FirstName = "James"
AND PRODUCT_MANAGER.LastName = "Fitz"
AND PRODUCT_MANAGER.ManagerID
GAME_DEVELOPMENT.ManagerID
= ..... ;

```

[3]

7 A company allows customers to stream music from its servers over the Internet. The company’s internet connection is currently provided through copper cables.

(a) Identify **two** pieces of hardware, other than the cables, that enable the servers to connect to the Internet. Describe the purpose of each device.

Device 1 Router

Purpose To connect the company's server to the Internet.

Device 2 Network Interface Card

Purpose To enable the servers to connect to the company network

[4]

(b) The company wants to upgrade their internet connection to fibre- optic cables.

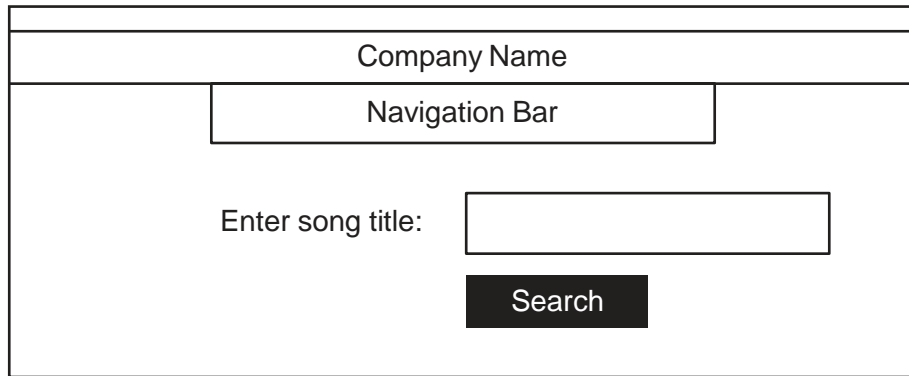
Give **one** benefit and **one** drawback to the company of upgrading to fibre- optic cables.

Benefit Fibre optic cables enable faster data transmission.

Drawback The initial cost will be high as new hardware is needed.

[2]

- (c) A customer enters a song title into a web page to listen to the song. The design of the web page is shown:



The web page will make use of both client- side and server- side scripting.

- (i) Explain how client- side scripting will be used in this web page.

With client-side scripting, it is possible to provide interactive features.
For this purpose JavaScript can be used.
User input can be validated at the client-side itself.

..... [3]

- (ii) Explain how server- side scripting will be used after the customer clicks the 'Search' button.

PHP can be used to do server-side scripting.
When customer clicks 'Search', the song database is accessed.
Plays the song if available, else displays a message.

..... [2]

(d) The company needs to keep the data on its servers secure from online threats.

(i) Describe how a firewall will help to protect the data on the servers from online threats.

A firewall helps to prevent unauthorised access to the data on the company servers.

It can also monitor incoming and outgoing traffic to and from the servers.

.....
.....
..... [2]

(ii) Give **one additional** security measure that the company can use to protect the data on the servers from online threats.

An additional security measure would be, to constantly update and run antivirus software.

..... [1]

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