OCR
Oxford Cambridge and RSA

Monday 16 May 2022 – Afternoon

GCSE (9–1) Computer Science

J277/01 Computer Systems

Time allowed: 1 hour 30 minutes

Do not use:
- a calculator

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) MyCSTutor.co.uk

Last name Computer Science Worked Solutions

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.

INFORMATION
- The total mark for this paper is **80**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **16** pages.

ADVICE
- Read each question carefully before you start your answer.

Answer **all** the questions.

1 Computers represent data in binary form.

(a) Tick (✓) **one** box in each row to identify the binary unit equivalent of each of the given file sizes.

megabyte = 1000 KB petabyte = 1000TB kilobyte = 1000 bytes gigabyte = 1000MB

File size	2 megabytes	2 petabytes	2 kilobytes	2 bytes	2 gigabytes
2000 bytes			✓		
2000 terabytes		✓			
16 bits				✓	
4 nibbles				✓	

[4]

(b) Convert the denary number 221 into 8 bit binary. Show your working.

128 64 32 16 8 4 2 1

1 1 0 1 1 1 0 1

128 + 64 + 16 + 8 + 4 + 1 = 220

[2]

(c) Convert the hexadecimal number 2F into denary. Show your working.

2x16 = 32 15 x 1 = 15

32 + 15 = 47

[2]

(d) Convert the binary number 10110000 into hexadecimal.

11 0

= B0

[1]

(e) Identify how many unique values can be represented by 4 bits.

$2^4 = 16$

[1]

(f) Perform a binary shift of 3 places right on the binary number 10001110.

00010001

[1]

right shift = add 0's on the left

2 Complete the table by writing the missing definition or name of each of the common CPU components and registers.

CPU component or register	Definition
Program counter (PC)	Stores the address of the next instruction to be fetched from memory. Increments during each fetch-execute cycle.
CU (Control Unit)	Controls flow of data
Memory Address Register (MAR)	Stores the address of the data to be fetched from or the address where the data is to be stored.
Arithmetic Logic Unit (ALU)	Performs mathematical calculations and logical operations.

[4]

3 A library has a LAN (Local Area Network).

(a) The LAN allows access by both wired and wireless devices.

Users have reported that the network sometimes runs very slowly.

(i) Explain why the number of devices using the network at the same time can affect the performance of the network.

.....

Bandwidth split between all devices - so less bandwidth for each device

.....

More frequent data collisions

.....

More packets lost

.....

.....

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

(ii) Identify **one** other factor that can affect the performance of the network.

.....

Wired or wireless network

..... **[1]**

(b) Users can access websites from the library computers.

Complete the description of accessing websites using the given list of terms. Not all terms will be used.

0 1 127 128 255 256 Colon

Domain Name Server Embedded systems File server Full stop

Hyphen Internet protocol MAC address Router

Uniform Resource Locator Web server Clients

A website is hosted on a web server . The computers that access the websites are called clients .

The user enters the Uniform Resource Locator (URL) into a web browser. The web browser sends a request to the Domain Name Server (DNS) for the matching IP (Internet Protocol) address. If found the IP address is returned. A request is then sent to this IP address.

An IPv4 address is made of 4 groups of digits. Each group can be between the denary values 0 and 255 . The groups of digits are separated by a full stop .

[7]

(c) The wired connection is an Ethernet connection. Ethernet is considered a standard.

Explain why Ethernet is a standard.

.....

Used in lots of devices. Has a high bandwith. Low cost compared to other wired connections

.....

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

(d) The network has several routers.

Identify **three** tasks carried out by a router.

1 .....

Recieve packets

.....

2 Transmit packets .....

.....

3 Identify most efficient path to destination .....

.....

[3]

(e) The library does not use encryption when data is transmitted through the network.

Give **two** reasons why the library should use encryption.

1 Only authorised users can access the CONFIDENTIAL data .....

.....

2 Data can't be understood if intercepted .....

.....

[2]

(f) Protocols are used to transmit data through the network and over the internet.

Identify **one** protocol that can be used to perform each of the following tasks:

Send an email SMTP .....

Access a website securely ..... HTTPS .....

[2]

4* Social networking websites use artificial intelligence (AI) to monitor posts from users.

Discuss the positive and negative uses of AI by social networking websites including:

- Legal issues
- Ethical issues
- Privacy issues

LEGAL ISSUES:

AI can automatically check for plagiarism + highlight posts

According to the data protection act, we need to make sure that the AI follows rules so for example security rules aren't breached

User (should) have agreed terms when signing up for social networking, so should be expected

ETHICAL ISSUES:

May incorrectly monitor posts + block innocent posts

Monitoring of posts may be stored and used for other means

Users may feel safer as inappropriate posts should be blocked

Websites have to inform user of use of AI, and user must agree

PRIVACY ISSUES:

Users may feel like they are being watched all the time

Terms and conditions may sign away rights to privacy

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... **[8]**

5 A software development company wants to protect their computer systems and data from unauthorised access.

(a) Identify **two** methods of physical security that the company could use to protect their computer systems.

1 Locks

2 Alarms / cctv

[2]

(b) Identify **and** describe **two** software-based security methods that the company can use to protect their computer systems and data.

Method 1 Encryption

Description scrambles data using an algorithm, so if intercepted data can't be understood

Method 2 Passwords

Description Strong password is unique, harder for brute-force attack to succeed

[6]

(c) Tick (✓) **one** box on each row to identify the legislation that would cover each of the given events.

Event	The Data Protection Act (2018)	Computer Misuse Act (1990)	Copyright Designs and Patents Act (1988)
A company transmits personal data to another company without the individual's permission.	✓		
A school accidentally publishes their students' addresses on the school website.	✓		
The interface for a piece of software is replicated by a rival company.			✓
A user leaves a computer logged on and another person leaves them a message on their desktop.		✓	
A student guesses their teacher's password and accesses their computer account.		✓	

[5]

6 A student is creating a range of documents for a school project.

(a) The student records a podcast about computer science.

(i) Describe how an analogue sound wave is converted into digital form.

.....

Sound wave is sampled, and the amplitude of the wave is measured at regular time intervals

.....

Each sample is stored as a binary number

.....

.....

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

(ii) Tick (✓) **one or more** boxes on each row to identify the effect(s) that each change will have on the sound file.

Change	File size increases	File size decreases	Accuracy increases	Accuracy decreases
Duration changes from 10 minutes to 20 minutes	✓			
Sample rate changes from 44 kilohertz to 8 kilohertz		✓		✓
Bit depth changes from 8 bits to 16 bits	✓		✓	

[3]

(b) The student writes a report about volcanoes.

(i) The computer stores text using the ASCII character set.

Part of the ASCII character set is shown:

Character	ASCII denary code
M	77
N	78
O	79
P	80
Q	81

Identify the character that will be represented by the ASCII denary code 84.

T

..... **[1]**

(ii) Identify a second character set.

unicode

..... **[1]**

(c) The student takes a photograph of their science experiment. The image file includes metadata.

Identify **three** pieces of metadata that is often stored with an image.

1 height .....

2 width .....

3 colour depth .....

[3]

(d) The student compresses all their documents before emailing them to their teacher.

(i) Give **two** benefits of compressing the data before it is emailed.

1 .....

Smaller file size

.....

2 Quicker data transmission .....

.....

[2]

(ii) Explain why lossy compression may **not** be appropriate to compress all of the student's files.

.....

Files such as text files can't be compressed - not all data is recoverable

.....

.....

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

7 A smart television allows the user to search the Internet and watch videos online.

(a) The smart television has both RAM and ROM.

(i) State the difference between RAM and ROM.

ROM non volatile, RAM volotile

..... **[1]**

(ii) Give **two** examples of data that the smart television could store in RAM.

1 Volume

2 Current channel

[2]

(b) The smart television has secondary storage.

(i) State, using an example, why the smart television needs secondary storage.

Stored data so it is kept when tv is turned off , such as recordings

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

(ii) Identify **one** appropriate type of secondary storage for the smart television. Justify your choice.

Secondary storage type Solid state

Justification

Large capacity

Quick data access

Quiet - no moving parts

..... **[4]**

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).