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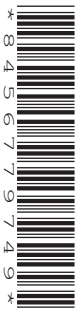

COMPUTER SCIENCE **0478/11**

Paper 1 Computer Systems **May/June 2023**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- 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.
- 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 **12** pages. Any blank pages are indicated.

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[Turn over

1 Binary is a number system used by computers.

(a) Tick (✓) **one** box to show which statement about the binary number system is correct.

doesnt exist **A** It is a base 1 system ☐

✓ **B** It is a base 2 system ☑

decimal / denary **C** It is a base 10 system ☐

hexadecimal **D** It is a base 16 system ☐

[1]

(b) Denary numbers are converted to binary numbers to be processed by a computer.

Convert these **three** denary numbers to 8-bit binary numbers.

128 64 32 16 8 4 2 1

50 00110010

102 01100110

221 11011101

[3]

Working space

.....

.....

.....

.....

(c) Binary numbers are stored in registers.

Negative denary numbers can be represented as binary using two's complement.

Complete the binary register for the denary number –78

You must show all your working.

Working space

128 64 32 16 8 4 2 1

78 = 0 1 0 0 1 1 1 0

flip bits 1 0 1 1 0 0 0 1

add 1 1 0 1 1 0 0 1 0

Register:

1	0	1	1	0	0	1	0

[2]

(d) Two 8-bit binary numbers are given.

Add the **two** 8-bit binary numbers using binary addition.

Give your answer in binary. Show all your working.

```
  00110011
+ 01100001
  ________
  10010100
```

if two 1's, put 0 and carry

if three 1's, put 1 and carry

[3]

(e) Two binary numbers are added by a computer and an overflow error occurs.

Explain why the overflow error occurred.

(Assuming 8 bit system), the result of the calculation may be greater than 2^8 -1 / 255, so the value is too large to be stored by the register.The calculated value would require more than 8 bits to be represented.

[2]

2 A student has a sound file that is too large to be stored on their external secondary storage device. The student compresses the sound file to make the file size smaller.

The compression method used reduces the sample rate and the sample resolution of the sound file.

(a) State what is meant by the sample rate and sample resolution.

Sample rate Number of samples taken per second .....

.....

Sample resolution Number of bits per sample .....

.....

[2]

(b) Identify which type of compression has been used to compress the sound file.

LOSSY (as resolution and number of samples have been sacrificed, won't be able to recover) .....

..... [1]

(c) The student sends the sound file to a friend. The file is transmitted across a network that uses packet switching.

(i) Identify **two** pieces of data that would be included in the header of each packet.

1 Destination IP Address .....

2 Origin IP Address .....

[2]

(ii) Explain how the file is transmitted using packet switching.

.....

Data is brken into chunks (PACKETS)

.....

Routers direct the packet to the fastest available route

.....

Packets may arrive out of order, and are re-ordered at the end of transmission

.....

If some packets are lost, a request is filed to be sent again

.....

.....

.....

.....

.....

..... [5]

RAM,ROM,CPU all core components, so primary

3 Secondary storage devices are used to store data in a computer.

(a) Circle **three** components that are secondary storage devices.

central processing unit (CPU)

compact disk (CD)

hard disk drive (HDD)

random access memory (RAM)

read only memory (ROM)

register

sensor

solid-state drive (SSD)

[3]

(b) Tick (✓) **one** box to show which statement about secondary storage is correct.

A It is directly accessed by the CPU. ☐

B It is magnetic storage only. ☐

C It is used to permanently store software and data files. ☑

D It is volatile. ☐

[1]

4 Complete the statements about different types of software.

Use the terms from the list.

Some of the terms in the list will **not** be used. You should only use a term once.

application assembly language bootloader central processing unit (CPU)

firmware hardware operating output system user

Systems

..... software provides the services that the computer requires; an example is utility software.

Application

..... software is run on the operating system.

The operating ..... system is run on the firmware, which is run on

hardware

the ..... .

[4]

5 A farm has an automated drinking system for its animals. The drinking system has a water bowl that contains the water. When the water bowl is empty, it is automatically refilled.

The system uses a sensor and a microprocessor.

(a) Identify the most appropriate sensor for this system.

Moisture (as when no moisture, we refill)

..... [1]

(b) Describe how the sensor and the microprocessor are used to automatically refill the water bowl.

.....

The sensor is continually sending digitalised data to the microprocessor

.....

The microprocessor compares this data to a stored value

.....

If value is outside a range, a signal is sent by the microproessor to refill the bowl for a set amount of time at a set rate

.....

An ACTUATOR is used to release the water. This repeats until stopped

.....

.....

.....

.....

.....

.....

..... [6]

6 A user wants to connect their computer to a network.

(a) **(i)** Identify the component in the computer that is needed to access a network.

Network Interface Card (NIC)

..... [1]

(ii) Identify the type of address that is allocated to the component by the manufacturer, which is used to uniquely identify the device.

MAC Address

..... [1]

(b) A dynamic internet protocol (IP) address is allocated to the computer when it is connected to the network.

(i) Identify the device on the network that can connect multiple devices and automatically assign them an IP address.

Router

..... [1]

(ii) Describe what is meant by a dynamic IP address.

.....

An IP address that changes every time the device is connected to the network

.....

Used to uniquely identify a device

.....

.....

.....

..... [3]

7 A programmer uses a low-level language to write a computer program for a vending machine.

(a) Describe what is meant by a low-level language.

.....

Language that is easily translated by computers, eg machine code

.....

.....

..... [2]

(b) Give **two** reasons why the programmer would choose to write the computer program in a low-level language instead of a high-level language.

1 More memory efficient program .....

.....

2 Quicker program execution .....

.....

[2]

8 A manager at a company is concerned about a brute-force attack on its employee user accounts.

(a) Describe how a brute-force attack can be used to gain access to the employee user accounts.

Uses algorithm guessing passwords of users to crack

Combinations are repeatedly entered by the software until the correct password is found

[3]

(b) One possible aim for carrying out a brute-force attack is to install malware onto the company network.

(i) State **two** other aims for carrying out a brute-force attack to gain access to the employee user accounts.

1 Steal / collect personal data

2 Change / delete data

[2]

(ii) Identify **three** types of malware that could be installed.

1 Spyware

2 Trojan

3 Virus

[3]

(c) Give **two** security solutions that could be used to help prevent a brute-force attack being successful.

1 2FA / Two factor authentication

2 Biometric solution e.g fingerprint, facial recognition

[2]

9 A company uses robots in its factory to manufacture large pieces of furniture.

(a) One characteristic of a robot is that it is programmable.

State **two** other characteristics of a robot.

1 .....
Has electrical components
.....

2 .....
Has mechanical structure
.....
[2]

(b) Give **two** advantages to company employees of using robots to manufacture large pieces of furniture.

1 Protects accidents + injuries from occuring .....

.....

2 Employees can be used for other skills .....

.....
[2]

(c) Give **one** disadvantage to the company's owners of using robots to manufacture large pieces of furniture.

.....
Expensive to install + high maintenance cost
..... [1]

10 A student uses the internet for their schoolwork to research what is meant by pharming.

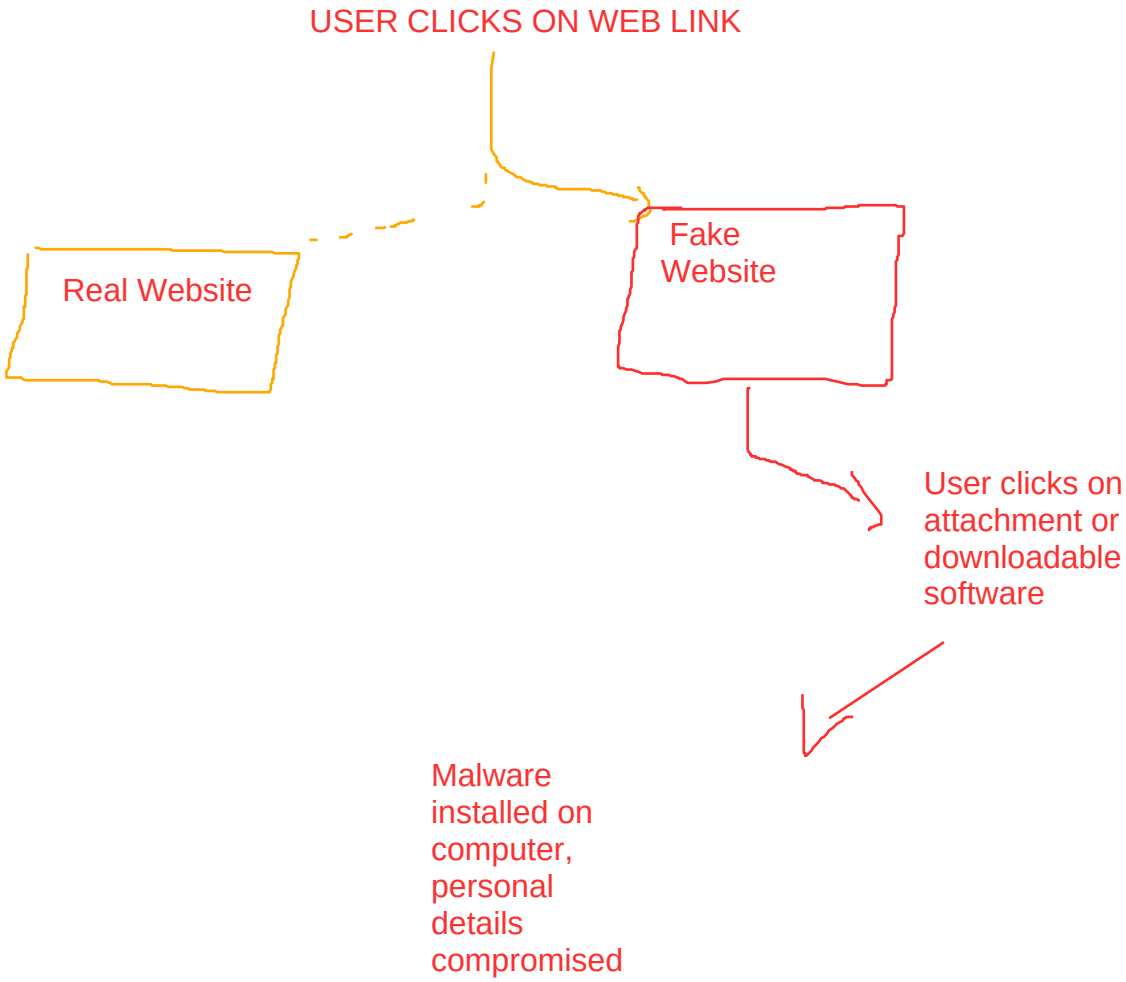
(a) State the aim of pharming.

.....

To get personal information / details

..... [1]

(b) Draw and annotate a diagram to represent the process of pharming.



[4]

(c) The student uses a web browser to access data on the internet.

Explain the purpose of the web browser.

.....

Renders HTML to display web pasges

.....

.....

..... [2]

(d) Storing cookies is one function of the web browser.

Give **three** other functions of the web browser.

1 .....

Allows user to open multiple tabs

.....

2 Allows files to be downloaded from website .....

.....

3 Allows for bookmarked websites .....

.....

[3]

(e) A student visits a website that uses session cookies, instead of persistent cookies.

Explain the difference between session cookies and persistent cookies.

.....

Session cookies are stored in memory, persistant cookies are stored in secondary storage

.....

This means persistent cookies are in non-volatile memory, so aren't lost when browser is closed, where as session cookes are in volatile memory, so are lost when browser closes

.....

.....

.....

.....

..... [4]

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