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4624325530

COMPUTER SCIENCE **0478/13**

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.

[Turn over

1 Computers store data as binary. The binary number 10101110 is stored.

(a) Convert the binary number to denary.

..... [1]

Working space

.....

.....

.....

(b) Convert the binary number to hexadecimal.

..... [2]

Working space

.....

.....

.....

(c) A logical left shift of **three** places is performed on the binary number.

(i) Give the 8-bit binary number that would be stored after this logical left shift.

..... [1]

(ii) Tick (✓) **one** box to show which statement is true about the impact the logical left binary shift would have on the binary number.

A The least significant bits are lost. ☐

B The most significant bits are lost. ☐

C The number has been divided by six. ☐

D The number stays the same. ☐

[1]

(d) Add the **two** 8-bit binary numbers 11101110 and 00110001 using binary addition.

Give your answer in binary. Show all your working.

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..... [4]

(e) The denary number 301 needs to be stored.

Calculate the least number of bits that can be used to store the denary number 301.

..... [1]

Working space

.....

.....

.....

(f) The hexadecimal number A4D needs to be stored.

Calculate the least number of bits that can be used to store the hexadecimal number A4D.

..... [1]

Working space

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2 A library has a self-checkout system that allows customers to register books that they want to borrow.

The self-checkout system has a central processing unit (CPU).

The CPU has two cores.

(a) State the purpose of a core in the CPU.

.....

..... [1]

(b) The CPU is replaced with one that has four cores.

Explain the effect this has on the performance of the self-checkout system.

.....

.....

.....

..... [2]

(c) The CPU contains registers and buses.

(i) Describe the role of a register in the CPU.

.....

.....

.....

..... [2]

(ii) Identify **one** bus that can be found in the CPU and explain its purpose in the fetch–decode–execute cycle.

Bus .....

Purpose .....

.....

.....

.....

[3]

(d) The self-checkout system allows the user to input their library membership number.

Give **two** appropriate input devices that would allow the user to do this.

1 .....

2 .....
[2]

(e) The self-checkout system uses a monitor to display information about the book.

Users who are blind also need to use the self-checkout system.

Give an appropriate output device that would allow a blind user to be given this information.

..... [1]

(f) The self-checkout system uses two types of primary storage.

Circle **two** types of primary storage that would be used in the system.

compact disk (CD)	digital versatile disk (DVD)
hard disk drive (HDD)	random access memory (RAM)
read only memory (ROM)	universal serial bus (USB) flash memory drive

[2]

(g) The self-checkout system is linked to a stock control system that is updated every time a book is borrowed from the library.

A microprocessor is used in the stock control system to update the stock.

Explain the role of the microprocessor in this system and how it is used to update the stock when a book is borrowed.

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.....

..... [3]

3 **Five** network terms or definitions are given in the table.

Complete the table by giving the missing term or definition.

Term	Definition
router	....
.....	This address is assigned by the network and used to identify a device on a network.
network interface card (NIC)	....
.....	This address is assigned by the manufacturer and is used to uniquely identify the device.
.....	This can be hardware or software based and filters traffic coming into and out of a network.

[5]

4 A programmer writes a computer program in a high-level language.

(a) Tick (✓) **one** box to show which statement is a benefit of writing a program in a high-level language, instead of a low-level language.

A The program can directly manipulate the hardware. ☐

B The program is machine independent. ☐

C The program is more memory efficient. ☐

D The program is quicker to execute. ☐

[1]

(b) Translators are used to translate the high-level language so that it can be processed by the computer.

(i) State what the high-level language is translated into.

..... [1]

(ii) One translator converts and executes the code line by line.

Identify which type of translator would do this.

..... [1]

(iii) One translator creates an error report displaying all the errors in the code before it can be executed.

Identify which type of translator would do this.

..... [1]

(iv) One translator creates an executable file.

Identify which type of translator would do this.

..... [1]

5 Complete and annotate the diagram to demonstrate how packet switching is used to transmit data across a network, including the use of routers, from Device A to Device B.

[4]

6 A student is writing a help guide about how to recognise and avoid the cyber-security threat of pharming.

(a) Give **three** appropriate solutions he could include.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(b) The student also wants to include information in the help guide about the use of social engineering as a cyber-security threat.

Describe what is meant by social engineering.

Include **one** example of social engineering in your answer.

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..... [3]

(c) The student includes information about the security solution of access levels.

Describe what is meant by access levels.

.....

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..... [3]

7 The rule base and the inference engine are two components of an expert system.

(a) Identify the other **two** components of an expert system.

1 .....

2 .....
[2]

(b) Describe the role of the rule base in an expert system.

.....

.....

.....

..... [2]

8 Complete the statements about a distributed denial of service (DDoS) attack.

Use the terms from the list.

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

anti-virus	bot	botnet	hacker
internet	malware	secondary storage	
spyware	web browser	web server	website

The attacker encourages people to download ..... onto their computer. This will turn each computer into a ..... , creating a network called a ..... .

When the attacker wants the DDoS to take place, repeated requests are simultaneously sent from the computers to a ..... . This causes it to crash, meaning that users can no longer access the ..... that is stored on this hardware.

[5]

9 A device can be given an internet protocol (IP) address. This can be an IPv4 or IPv6.

(a) Give **one** similarity between IPv4 and IPv6.

.....

..... [1]

(b) Describe **two** differences between IPv4 and IPv6.

1 .....

.....

.....

.....

2 .....

.....

.....

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[4]

(c) A web page is requested using an IP address.

(i) Identify the system that stores a database of uniform resource locators (URLs) and their corresponding IP addresses.

..... [1]

(ii) Identify the software that sends a request to the IP address to obtain the web page data.

..... [1]

10 A computer has pages A, B and C that are stored in RAM. Page D needs to be sent to the RAM but the RAM is full.

Page B is **not** needed immediately.

Explain how virtual memory can be used in this scenario.

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..... [4]

11 Software is installed on a computer to manage files, memory and multitasking.

(a) State the name of the software that can do these tasks.

..... [1]

(b) Give **one** task that the software allows the user to do to manage files.

..... [1]

(c) Describe what is meant by managing memory.

.....

.....

.....

..... [2]

(d) A signal is sent within the computer to allow multitasking to occur.

State the name of this type of signal.

..... [1]