

2 A computer with a Von Neumann architecture has a central processing unit (CPU) that carries out the fetch-decode-execute (FDE) cycle.

(a) Give the name of the first register that is used in the fetch part of the cycle.
..... [1]

(b) The CPU has a control unit (CU).

(i) Describe the role of the CU in the CPU.
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.....
..... [3]

(ii) Give the name of the register that is part of the CU.
..... [1]

(c) The computer has primary storage. One example of primary storage is cache.

(i) Tick (✓) **one** box to show the correct statement that describes the purpose of cache.

A It stores important instructions.

B It stores the next instruction to be processed.

C It stores frequently used instructions.

D It stores instructions so they are not lost when the power is turned off.

[1]

(ii) Give **one** other example of primary storage.

Identify the type of data your example would store.

Primary storage

Data

..... [2]

(d) The computer also has secondary storage.

Write the name of the type of secondary storage for each description in the table. Each type of secondary storage may be used more than once.

Type of secondary storage	Description
.....	It burns pits and lands onto a disk.
.....	It uses control gates and flow gates.
.....	It uses NAND or NOR technology.
.....	The surface of each platter is divided into tracks and sectors.
.....	It has a read/write arm that moves a laser across a disc.
.....	It controls the flow of electrons using transistors.

[6]

1 A computer stores data temporarily in random access memory (RAM).

(a) RAM is one example of primary storage.

Give **one** other example of primary storage.

..... [1]

(b) Give **one** reason why data is only stored temporarily in the RAM.

..... [1]

(c) The denary numbers 19 and 230 are converted to binary numbers to be stored in the RAM.

Convert the **two** denary numbers to binary numbers.

19

230 [2]

Working space

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(d) The hexadecimal numbers 35 and 8AD are converted to binary numbers to be stored in the RAM.

Convert the **two** hexadecimal numbers to binary numbers.

35

8AD [2]

Working space

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(e) The 8-bit binary numbers 01100101 and 01110000 are stored in RAM.

The binary numbers are added together.

Add the **two** binary numbers using binary addition.

Give your answer in binary. You must show all your working.

0 1 1 0 0 1 0 1
 + 0 1 1 1 0 0 0 0

[3]

(f) An overflow occurs when two other 8-bit binary numbers are added together.

Explain why the overflow error occurs.

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 [2]

(g) The negative denary number -22 is stored in RAM.

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

Give the two's complement 8-bit binary integer that would be stored for the denary number -22.

You must show all your working.

Working space

Two's complement 8-bit binary integer [2]

- 7** A train station has a ticket inspector who checks each customer's ticket before they are allowed to get on the train.

The train station wants a system that will allow the tickets to be automatically checked.

- (a)** Identify **two** suitable input devices that can be used to automatically read the tickets.

1

2

[2]

- (b)** The train driver pushes a button to close the train door when all passengers have boarded the train. The train door will only close when there are no passengers in the doorway.

The system to check there are no passengers in the doorway uses a sensor and a microprocessor.

Explain how the sensor and the microprocessor are used to check whether the train door can be closed.

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..... [6]