

Past-paper walk-through

Computers and their components ■ 3.1

eXercise

Questions in this set

- 9618/11 N25 Q9 ■ 3 marks
- 9618/11 N25 Q10 ■ 4 marks
- 9618/12 N25 Q11 ■ 3 marks
- 9618/11 J25 Q4 ■ 6 marks
- 9618/11 J25 Q6 ■ 14 marks
- 9618/12 N24 Q2 ■ 6 marks
- 9618/12 N24 Q9 ■ 4 marks
- 9618/13 N24 Q2 ■ 6 marks
- 9618/13 N24 Q3 ■ 3 marks
- 9618/11 J24 Q2 ■ 18 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 9

9618/11 N25 ■ Q9 ■ 3 marks

Describe the differences between a monitoring system and a control system.

[3]

Solution 9

- 1 mark per bullet point, max 3 marks
- ■ Monitoring systems do not take any action whereas control systems act autonomously to change the environment if the values are out of a prescribed range
- ■ Control systems use actuators monitoring systems do not have any actuators
- ■ Control systems make use of feedback monitoring systems do not make use of feedback
- ■ The output from a monitoring system does not affect the subsequent input whereas output from a control system affects the next input.

Solution 9

- 3
- October/November
- 2025

Question 10

9618/11 N25 ■ Q10 ■ 4 marks

An architect needs a model of a building.

(a) Explain how the model will be printed using a 3D printer.

[3]

(b) State why a 3D printer needs a buffer.

[1]

Solution 10

(a) Mark scheme

- 1 mark per bullet point, max 3 marks
- Generic mark points: (max 3)
 - ■ Additive manufacturing
 - ■ Uses a digital file created from 3D modelling software or Computer Aided
- Design (CAD) software
 - ■ The printer builds up the model one layer at a time
 - ■ The process is repeated for each layer

Solution 10

- ■ Some materials may need time to cool and set or UV curing using LEDs for photopolymer resins
- Specific mark points: (max 1) e.g.
- ■ Fused Deposition Modelling (FDM) // Material is heated and pushed through nozzle / extruder
- ■ Stereolithography (SLA) // Photosensitive liquid resin is exposed to a UV-laser beam
- ■ Digital Light Processing (DLP) // Photosensitive liquid resin is exposed to a UV projected image of the layer to cure the resin
- ■ Selective Laser Sintering (SLS) // Uses a laser to form objects from powdered material, the material can be plastics or metals

Solution 10

(b)

Mark scheme

- 1 mark
- ■ To free up the processor to carry out other tasks as the rate data is received by the printer is different from the rate at which it can be processed
- ■ To manage the mismatch in speed between the processor and the peripheral / 3D printer

Question 11

9618/12 N25 ■ Q11 ■ 3 marks

An automated system opens doors when a person is detected within 2 metres. The system closes the doors when there is no longer a person within 2 metres.

Identify whether the automated system is an example of a monitoring system or a control system.

Justify your choice.

Justification

[3]

Solution 11

Mark scheme

- 1 mark per bullet point, max 3 marks
- Identification: Control system (no mark)
- Justification:
 - ■ The system uses an actuator to open or close the doors
 - ■ The output / opening the doors allows people to move, which changes the input to the sensor
 - ■ The system acts autonomously on the feedback from a sensor

Question 4

9618/11 J25 ■ Q4 ■ 6 marks

A shop installs a new system that allows users to purchase items without going through a manual checkout.

The new system:

- identifies customers when they enter the shop and matches them to their account
- prevents a customer from walking through the automatic barriers if they do not have an account
- automatically detects the items that a customer has taken from a shelf and charges these to the customer's account.

Question 4

(a) The new system uses digital cameras and Artificial Intelligence (AI) to identify the customers.

Explain how the new system uses AI to identify each customer. [4]

(b) The new system uses sensors to identify the items taken from a shelf.
Identify **one** type of sensor that can be used in this new system.

State how the sensor can be used to identify the items taken from a shelf. [2]

Solution 4

(a) Mark scheme

- 1 mark each to max 4 e.g.
- ■ Uses image recognition / facial recognition
- ■ Measures the distance between facial features of the customer
- ■ and stores the values in a database of user information
- ■ An image is captured using the digital camera
- ■ the AI identifies that the image is a face
- ■ by analysing the pixels to find patterns
- ■ the distance between features is calculated and compared to those in database

Solution 4

(b) Mark scheme

- 1 mark for sensor, 1 mark for corresponding use e.g.
- Sensor
- Use
- Pressure
- Detects when the pressure of an item is removed from a shelf / put back on a shelf
- Infrared
- Detects when the beam is broken for an item removed / added

Question 6

9618/11 J25 ■ Q6 ■ 14 marks

A programmer is buying a new computer.

(a)(i) Computer 1 has a magnetic hard disk.

Complete the description of the principal operation of a magnetic hard disk by writing the missing words.

The magnetic hard disk has one or more ____ that can be magnetised. These are mounted on a ____ and rotate at high speed.

A ____ is moved across the surface on an arm.

When data is read, the changes in the ____ produce a change in the electric current. **[4]**

(a)(ii) The two computers have different amounts of RAM.

Explain how different amounts of RAM affect the performance of a computer. **[3]**

(a)(iii) The two computers have different bus widths.

Explain how different bus widths affect the performance of a computer. **[2]**

Question 6

Computer 1	Quad-core 2.2 GHz processor 16-bit architecture 1 GB Random Access Memory (RAM) 500 GB magnetic hard disk
Computer 2	Dual-core 3.8 GHz processor 32-bit architecture 2 GB RAM 500 GB solid state drive (SSD)

Question 6

9618/11 J25 ■ Q6 ■ 14 marks

A programmer is buying a new computer.

(b) Both computers have an Operating System (OS).

Describe the purpose of an OS in a computer.

[5]

Solution 6

(a)(i) Mark scheme

- 1 mark for each correctly completed space
- ■ platters
- ■ spindle
- ■ read/write head
- ■ magnetic field
- The magnetic hard disk has one or more platters that can be magnetised.
- These are mounted on a spindle and rotate at high speed.
- A read/write head is moved across the surface on an arm.

Solution 6

- When data is read the changes in the magnetic field produce a change in the electric current.

Solution 6

(a)(ii)

Mark scheme

- 1 mark each to max 3
- ■ More RAM means more currently running data and instructions can be stored
- ■ without needing to use virtual memory
- ■ without having to fetch the data from secondary storage first
- ■ which has a slower access time
- ■ Less latency / delay waiting for instructions / data

Solution 6

(a)(iii)

Mark scheme

- 1 mark each to max 2 e.g.
- ■ Wider data bus means more data can be transferred between components at a time
- ■ there is less delay / latency when fetching data for a running process
- ■ Wider address bus means larger memory addresses can be used
- ■ allowing more memory locations to be accessed directly
- ■ so less likely to run out of memory

Solution 6

(b) Mark scheme

- 1 mark each to max 5 e.g.
 - To provide a user interface
 - so that the user is able to communicate with the hardware
 - To manage memory
 - so that data can be stored and accessed
 - and multitasking is possible
 - To manage files
 - allowing the user to create, edit, update and delete files and folders

Solution 6

- ■ To manage inputs and outputs from hardware/peripherals
- ■ To handle processes
- ■ to make sure each process has fair access

Question 2

9618/12 N24 ■ Q2 ■ 6 marks

Embedded systems are used in many electronic devices.

(a) Describe the drawbacks of embedded systems. [3]

(b) An embedded system has Dynamic RAM (DRAM).

Identify **one** benefit of using DRAM instead of Static RAM (SRAM) in an embedded system. [1]

(c) Give **two** differences between Erasable Programmable ROM (EPROM) and Electrically Erasable Programmable ROM (EEPROM).

Difference 1

Difference 2 [2]

Solution 2

(a) Mark scheme

- 1 mark for each bullet point (max 3) e.g.
- ■ It is difficult to change / update the firmware by the user
- ■ Errors cannot be fixed easily // Troubleshooting / fault-finding / repairing is a specialist task / expensive
- ■ Functionality cannot be changed/extended easily // Cannot be easily adapted for another task
- ■ Faulty / outdated devices are often thrown away rather than repaired
- ■ ... leading to e-waste

Solution 2

- 3
- October/November
- 2024

Solution 2

(b)

Mark scheme

- 1 mark from:
 - DRAM is less expensive to manufacture/purchase than SRAM in the embedded system
 - DRAM has a higher bit density per chip // more data can be stored per chip

Solution 2

(c)

Mark scheme

- 1 mark for each bullet point (max 2)
- ■ EPROM uses ultraviolet light to erase data whilst EEPROM uses an electrical signal to do this
- ■ EPROM has to be removed from the circuit board when changing the data whilst EEPROM remains in the circuit when the data is changed
- ■ EPROM erases all the data, EEPROM can erase parts of the data

Question 9

9618/12 N24 ■ Q9 ■ 4 marks

A road bridge has a weight limit and a height limit for vehicles. For example, a vehicle must weigh less than 10000 kg and must have a height of less than 3 m.

The bridge has a warning system. If a vehicle is approaching the bridge and it exceeds one or both limits, a sign displays a warning telling the driver of the vehicle to stop.

(a) The bridge warning system uses sensors to detect if a vehicle exceeds the limits.

Complete the table by identifying **two** different sensors that could be used by the system **and** describe how each sensor is used by the system.

Sensor	Use in bridge warning system

Question 9

[2]

Question 9

9618/12 N24 ■ Q9 ■ 4 marks

A road bridge has a weight limit and a height limit for vehicles. For example, a vehicle must weigh less than 10000 kg and must have a height of less than 3 m.

The bridge has a warning system. If a vehicle is approaching the bridge and it exceeds one or both limits, a sign displays a warning telling the driver of the vehicle to stop.

(b) Explain whether the bridge warning system is an example of a monitoring system or of a control system. **[2]**

Solution 9

(a)

Mark scheme

- 1 mark for sensor and its use in this system
 - Infra-red sensor
 - Measure / check the height of the vehicle
 - Pressure sensor
 - Measure / check the weight of the vehicle

Solution 9

(b)

Mark scheme

- 1 mark for each bullet point (max 2) for a correct justification
- No marks for the identification of the system
- Monitoring system
 - Because there is no use of feedback // the warning sign is only an indicator
 - ... the output of the turning on of the sign does not affect the input of data from the sensors
 - The system does not have any actuators

Question 2

9618/13 N24 ■ Q2 ■ 6 marks

2 A memory buffer uses Dynamic RAM (DRAM).

(a) Identify **two** differences between DRAM and Static RAM (SRAM).

Question 2

[2]

- (b) Explain how a memory buffer is used when a computer is transferring data to its magnetic hard disk drive.

Solution 2

(a) Mark scheme

- 1 mark for each difference
- e.g.
- ■
- DRAM requires constant refreshing, but SRAM does not need to be
- constantly refreshed
- ■
- DRAM generally has greater capacities per chip, but SRAM generally has
- lower capacities per chip

Solution 2

- ■
- DRAM has slower access times than SRAM
- 2

Solution 2

(b) Worked steps

A buffer exists because two devices work at **different speeds**. Build the answer from that one fact — four marks from:

- The computer and the hard disk **transmit and receive at different rates**; the computer can send data faster than the drive can accept it.
- The buffer provides **temporary storage** ...
- ... so the computer can hand its data over **at its own high speed** ...
- ... and is **not held up** waiting for the drive.
- The data is then passed from the buffer to the drive **at the slower rate** the drive can manage.

Solution 2

The shape that scores is: state the speed mismatch, then follow the data through the buffer in both directions. An answer that says only “a buffer stores data temporarily” is true of every buffer in the syllabus and explains nothing about why one is needed here. Worth adding if there is room: without the buffer the processor would have to wait for the drive, so it could do nothing else — the buffer is what lets it get on with other work. **Mark scheme**

- 1 mark for each bullet point (max 4)
- ■
- The computer and the hard disk drive transmit and receive at different
- speeds // The computer transfers data faster than the HDD can receive

Solution 2

- ■
- The buffer is used for temporary storage
- ■
- ... so that the computer can transfer data to the buffer at the higher speed
- ■
- ... and is not held up waiting for data to transfer
- ■
- ... and so that data is transferred to hard disk drive from the buffer at the
- slower rate
- 4

Solution 2

- 9618/13
- October/November
- 2024

Question 3

9618/13 N24 ■ Q3 ■ 3 marks

3 A car has an automatic braking system.

A sensor is used to measure the distance to objects that are in front of the car.

The car automatically brakes if an object is too close to the front of the car or the distance between the car and the object is decreasing too quickly. The closer the object is to the front of the car, the harder the car brakes so that the car slows down more quickly.

Explain the reasons why the automatic braking system of the car is a control system

[3] , ,

[3]

Solution 3

Worked steps

The distinction being tested is between **monitoring** and **control**. A monitoring system reads a sensor and reports; a control system reads a sensor and *acts*, changing the very quantity it is measuring. Three marks from:

- The system uses **feedback**.
- It acts **independently** — without a person deciding.
- The **input data causes the car to brake**.
- Braking **changes the distance** to the object ...
- ... and that **new distance is fed back** to decide whether, and how hard, to brake again.

Solution 3

Worked steps

The last three points are one argument in three steps, and setting them out in that order is what makes it a description of feedback rather than a list of features: measure → act → the action changes the measurement → measure again.

An answer that says only “it uses sensors” describes a monitoring system too, and scores nothing. The word that has to appear, in substance if not by name, is **feedback**. **Mark scheme**

- 1 mark for each bullet point (max 3)
- ■
- The system uses feedback

Solution 3

Worked steps

- ■
- The system acts independently
- ■
- Input data causes the car to brake
- ■
- ... braking decreases the/changes the distance to the object
- ■
- ... this new distance is used to determine whether/how hard the car
- needs to brake

Solution 3

Worked steps

■ 3

Question 2

9618/11 J24 ■ Q2 ■ 18 marks

- 2** A video doorbell is attached to the front door of a house. The doorbell uses a motion sensor to detect when a visitor walks in front of the door. When the motion sensor is activated:
- The digital camera in the doorbell starts recording a video.
 - A message is transmitted to a smartphone so that the person who lives in the house can watch the video.

The doorbell also has a button that can be pressed. When the button is pressed, a message is transmitted to a smartphone to play the doorbell sound.

The videos are stored on the doorbell's internal secondary storage device and overwritten when the secondary storage device is full.

Question 2



- (a) The video doorbell can be considered an example of an embedded system.

Identify **two** characteristics of the doorbell that suggest it is an embedded system.

Question 2

[2]

- (b) State whether the video doorbell is a monitoring system or a control system. Justify your choice.

Question 2

[2]

- (c) The video doorbell has both primary memory and secondary storage.
 - (i) Identify **two** items of data that the video doorbell will store in primary memory.

Question 2

[2]

- (ii) The video doorbell has a solid state (flash) secondary storage device.

Complete the table by writing the answer or answers to each statement about the principal operation of solid state (flash) memory.

Statement	Answer
the two types of logic gate that can be used to create solid state devices	1 2
the number of transistors contained in each cell	

Question 2



Question 2

the type of gate that can retain electrons without power	
the type of gate that allows or stops current from passing through	

[4]

(iii) The video doorbell uses a buffer.

Describe how the video doorbell will use the buffer.

Question 2

(d) The digital camera has a microphone which is used to record the sound for the video.

The user changes the sampling rate that the microphone uses from 44.1 kHz to 88.2 kHz.

Describe how this change in sampling rate will affect the performance of the video doorbell.

Question 2

- (e) The video doorbell allows both real-time and on-demand bit streaming.
 - (i) State what is meant by bit streaming.

Question 2

- (ii) Give **two** differences between real-time and on-demand bit streaming.

Question 2

[2]

Solution 2

(a) Worked steps

An embedded system is a computer built **into** a device to do one job. Two marks from:

- The doorbell performs only its **specific tasks** — motion detection, video recording, ringing.
- The motion sensor and camera are **built into** the device.
- Its CPU, memory, storage and software are **dedicated to that task alone**.
- Only a small dedicated microprocessor is needed, because the processing requirement is limited.

Solution 2

The contrast being drawn is with a general-purpose computer, which runs whatever software the user installs. Every point above says the same thing about a different component: this hardware cannot be repurposed. [Mark scheme](#)

- 1 mark each to max 2:
 - ■
 - The doorbell only performs the specific tasks of motion detection/video recording/doorbell ringing
 - ■
 - The motion sensor and digital camera are built into the doorbell

Solution 2

- ■
- The CPU/memory/storage/software are all dedicated to this task only
- ■
- Only a dedicated microprocessor is required due to the limited processing requirements
- 2

Solution 2

(b) Worked steps

△ **The identification earns nothing** — both marks are for the **justification**, and the mark scheme accepts either answer provided the reasoning matches it. So spend the words on *why*.

The test is a single question: **does the system's output change its own input?**

- Arguing **monitoring**: turning on the camera does not affect what the motion sensor detects; transmitting the video does not affect it either; ringing the bell does not affect the button being pressed. The system observes and reports, and nothing it does feeds back.
- Arguing **control**: identify an output that *does* change the input, and say how.

Solution 2

Whichever you choose, name a specific output and a specific input and state the relationship between them. “It monitors the door” is the identification, which is worth nothing on its own. **Mark scheme**

- No mark for identification of monitoring or control
- 1 mark each to max 2 for justification:
 - Monitoring:
 - ■
 - The turning on of the digital camera does not affect the input to the
 - sensor/button

Solution 2

- ■
- The transmission of the data/video does not affect the input to the
- sensor/button
- ■
- The ringing of the doorbell does not affect the input to the button
- Control:
- ■
- Video doorbell does not only store the values from the motion sensor
- ■
- The data is processed, generating a signal to start the digital camera

Solution 2

- recording
- ■
- Button pressed/motion detected causes a signal to be sent over a
- network to the smartphone
- 2

Solution 2

(c)(i) Worked steps

RAM holds whatever is **in use right now**. Two marks from:

- The **current reading** from the motion sensor.
- The **current or recent video** data.
- The **instructions being executed**.
- The **start-up / BIOS / boot instructions**, once copied there.

The discipline is to name things that are *transient*. Long-term storage of recorded video is secondary storage, and the firmware's permanent home is ROM — RAM holds the working copy. [Mark scheme](#)

Solution 2

- 1 mark each to max 2:
- ■
- Current reading/data from motion sensor
- ■
- Current/recent video
- ■
- Instructions being executed
- ■
- Start-up/BIOS/boot-up instructions
- 2

Solution 2

- 9618/11
- May/June 2024

Solution 2

(c)(ii) Mark scheme

- 1 mark for each row:
- Statement
- The two types of logic gate that can be used to create solid
- state devices
- NAND
- NOR
- The number of transistors contained in each cell
- 1 or 2

Solution 2

- The type of gate that can retain electrons without power
- floating
- The type of gate that allows or stops current from passing
- through
- control
- 4

Solution 2

(c)(iii) Mark scheme

- 1 mark each to max 2:
 - ■
- Captured video is transmitted to buffer
- ■
- ... video is transmitted from buffer to smartphone
- ■
- Store recent data in a buffer for the user to rewind
- ■

Solution 2

- ... instead of storing everything in secondary storage
- ■
- Store readings from motion sensor
- ■
- ... until the microprocessor can process them
- ■
- Store video from digital camera
- ■
- ... before moving it to secondary storage
- 2

Solution 2

(d) Worked steps

Higher resolution means more data per frame, and every consequence follows from that. Three marks from:

- **Transmission to the user's smartphone takes longer ...**
- ... because **there is more data to send**.
- The **secondary storage fills faster ...**
- ... so **fewer videos can be kept**, or they are overwritten sooner.

Note the pattern the mark scheme uses: a consequence, then the reason for it. Listing three consequences with no reasons earns about half the marks. [Mark scheme](#)

Solution 2

- 1 mark each to max 3:
- ■
- Data transmission to user's smartphone will take longer
- ■
- ... because there is more data to transmit
- ■
- The secondary storage device will fill faster
- ■
- ... fewer videos will be able to be stored long-term // videos are
- overwritten more often

Solution 2

■ 3

Solution 2

(e)(i)

Mark scheme

- 1 mark for:
- Continuous ordered flow of bits over a communication path
- 1

Solution 2

(e)(ii) Worked steps

Two marks for two **differences**, each stated as a contrast rather than as a property of one side.

- Real-time comes **direct from the source as it happens**; on-demand is **pre-recorded** and watched later.
- Real-time **cannot be rewound or re-watched**; on-demand can be paused, rewound and replayed.
- Real-time **plays continuously**; on-demand downloads in sections and cannot play past the end of a section until the next one has arrived.

Solution 2

Write each as “real-time ... whereas on-demand ...”. A sentence describing only one of them is not a difference, and this question is marked on the comparison. [Mark scheme](#)

- 1 mark each to max 2:

- ■

- Real-time is direct from source whereas on-demand is pre-

- recorded/downloaded to view later

- ■

- Real-time cannot be re-watched, on-demand can be paused, re-watched

- etc.

Solution 2

- ■
- Real-time plays continually, on-demand downloads sections/blocks and
- cannot play until next section is downloaded
- 2
- 9618/11
- May/June 2024