Past-paper walk-through

Types of software and interrupts ▪ 4.1

eXercise

Questions in this set

- 0478/12 N25 Q5 ▪ 10 marks
- 0478/13 J25 Q4 ▪ 6 marks
- 0478/11 N24 Q7 ▪ 4 marks
- 0478/12 N24 Q1 ▪ 3 marks
- 0478/11 J24 Q6 ▪ 4 marks
- 0478/12 J24 Q4 ▪ 5 marks
- 0478/13 J24 Q9 ▪ 9 marks
- 0478/12 M24 Q3 ▪ 10 marks
- 0478/11 N23 Q9 ▪ 10 marks
- 0478/11 J23 Q4 ▪ 4 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 5

0478/12 N25 ▪ Q5 ▪ 10 marks

A computer system has a mouse.

An interrupt is sent to the CPU every time a button on the mouse is clicked.

(a) Identify the name of this type of interrupt. **[1]**

(b) The interrupt is placed in a queue.

Explain how the interrupt is serviced after it is placed in the queue. **[4]**

(c)(i) Explain how data is sent using the USB connection. **[2]**

(c)(ii) Give **two** benefits of using a USB connection for this purpose.

1. 2. **[2]**

(c)(iii) Give **one** drawback of using a USB connection for this purpose. **[1]**

Solution 5

(a)

Mark scheme

- Hardware (interrupt)

Solution 5

(b) Mark scheme

- Any four from:
- ▪ Checks the priority of the interrupt
- ▪ If priority is higher, it halts the current process
- ▪ ... stores it on a stack
- ▪ ... fetches the interrupt
- ▪ ... checks the source of the interrupt
- ▪ ... calls the interrupt service routine (ISR) / interrupt handler to process the interrupt

Solution 5

- If priority is not higher, it continues with current process

Solution 5

(c)(i)

Mark scheme

- ▪ It is sent one bit at a time
- ▪ It is sent down a single wire

Solution 5

(c)(ii) Mark scheme

- Any two from:
- ▪ The mouse can be powered by the device
- ▪ It is a universal connection
- ▪ It is backward compatible
- ▪ Less chance of skewing // Less chance of errors
- ▪ Supports different data transmission speeds
- ▪ Adequate transmission speeds
- ▪ The cable cannot be inserted incorrectly

Solution 5

- ▪ The device is automatically detected // Driver is automatically installed when device is connected

Solution 5

(c)(iii)

Mark scheme

- Any one from:
- ▪ Slower transmission than a parallel connection
- ▪ Wire may get in the way // wire may limit movement of mouse

Question 4

0478/13 J25 ▪ Q4 ▪ 6 marks

A computer has an operating system.
One function of the operating system is handling interrupts.

(a) Describe the role of the operating system in handling interrupts. **[2]**

(b) Give **two** other functions of an operating system.
1. 2. **[2]**

(c)(i) Give **one** example of a hardware interrupt. **[1]**

(c)(ii) Give **one** example of a software interrupt. **[1]**

Solution 4

(a)

Mark scheme

- Any two from:
- ▪ It assigns a priority to an interrupt.
- ▪ It uses an interrupt handler / interrupt service routine to process the interrupt.
- ▪ Maintains/organises the interrupt queue

Solution 4

(b) Mark scheme

- Any two from:
- Examples:
- ▪ managing files
- ▪ providing an interface
- ▪ managing peripherals and drivers
- ▪ managing memory
- ▪ managing multitasking
- ▪ providing a platform for running applications

Solution 4

- providing system security
- managing user accounts

Solution 4

(c)(i)

Mark scheme

- Any one from:
- Examples:
- ▪ key press on a keyboard
- ▪ button clicks on a mouse
- ▪ printer out of ink

Solution 4

(c)(ii)

Mark scheme

- Any one from:
- Examples:
- ▪ division by zero
- ▪ two processes trying to access the same memory location

Question 7

0478/11 N24 ▪ Q7 ▪ 4 marks

A computer has an operating system.

(a)(i) Tick (✓) **one** box to show which of these is **not** a function of the operating system. **[1]**

- **A** managing files
- **B** providing an interface
- **C** handling interrupts
- **D** loading the bootstrap

(a)(ii) Identify **one** other function of an operating system.
Describe the purpose of this function. **[2]**

Question 7

0478/11 N24 ▪ Q7 ▪ 4 marks

A computer has an operating system.

(b) Give the name of the set of instructions that are provided to the operating system to allow it to run. **[1]**

Solution 7

A managing files

B providing an interface

C handling interrupts

D loading the bootstrap ✓

Answer: **D**

Question 1

0478/12 N24 ▪ Q1 ▪ 3 marks

Different types of software can be run on a computer.

(a) State what is meant by software. **[1]**

Question 1

0478/12 N24 ▪ Q1 ▪ 3 marks

Different types of software can be run on a computer.

(b) Utility software is one type of software that can be run on a computer.

Tick (✓) **one** box to show which software is an example of utility software. **[1]**

- **A** spreadsheet
- **B** anti-virus
- **C** web browser
- **D** database

Question 1

0478/12 N24 ▪ Q1 ▪ 3 marks

Different types of software can be run on a computer.

(c) Identify the type of software that manages inputs and outputs for the computer.**[1]**

Solution 1

(a)

Mark scheme

- Instructions/program that is used to operate a computer/hardware

Solution 1

(b)

Mark scheme

- B

Solution 1

(c)

Mark scheme

- Operating system // system software

Question 6

0478/11 J24 ▪ Q6 ▪ 4 marks

A computer needs firmware and system software to operate.

(a) State the purpose of firmware. **[1]**

(b) Give **one** example of firmware. **[1]**

(c) Give **two** examples of system software.

1. 2. **[2]**

Solution 6

(a) Mark scheme

- Any one from:
- ▪
- Permanently store instructions (in ROM)
- ▪
- Stores instructions to boot up/start up the computer
- ▪
- Provides the operating system with a platform to run on
- ▪

Solution 6

- Controls/manages/allows communication with hardware
- ▪
- Store instructions securely (to stop them being easily corrupted)

Solution 6

(b) Mark scheme

- Any one from:
- Example:
- ▪
- Bootstrap
- ▪
- Bootloader
- ▪
- BIOS

Solution 6

- ▪
- Operating system (in embedded system)
- ▪
- Programs (in embedded systems)

Solution 6

(c)

Mark scheme

- Any two from:
- ▪
- Operating system
- ▪
- Utility software
- NOTE: Two examples of utility software can be awarded

Question 4

0478/12 J24 ▪ Q4 ▪ 5 marks

A student uses both system software and application software on their computer.

(a) Give **one** example of system software. **[1]**

(b) Give **two** examples of application software.

1. 2. **[2]**

(c) Describe the difference between system software and application software. **[2]**

Solution 4

(a)

Mark scheme

- Any one from:
- ▪
- Operating system
- ▪
- Utility software // by example

Solution 4

(b) Mark scheme

- Any two from.:
- Example:
- ▪
- Word processor
- ▪
- Spreadsheet
- ▪
- Database

Solution 4

- ▪
- Web browser
- ▪
- Image/photo-editor
- ▪
- Video-editor
- ▪
- Email client
- ▪
- Game

Solution 4

- ▪
- Social media app

Solution 4

(c)

Mark scheme

- Any two from:
- ▪
- System software manages/maintains the hardware/software
- ▪
- Applications software allows the user to perform tasks

Question 9

0478/13 J24 ▪ Q9 ▪ 9 marks

A printer runs out of ink and needs a new ink cartridge. An interrupt is sent and a message is generated to notify the user that the ink cartridge is empty.

(a) Complete the paragraph about the use of an interrupt in this process.

Use the terms from the list.

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

- binary
- clock
- computer
- data
- error
- fetch–decode–execute cycle

Question 9

- hexadecimal
- higher
- interrupt queue
- interrupt service routine (ISR)
- lower
- printer
- priority level
- secondary storage
- sorting
- transmission

Question 9

The ___ sends an interrupt to the ___. The interrupt is given a ___. The processor completes its current ___ and checks the ___ to see if there is an interrupt with ___ priority than the current task. If there is, it stores the current task and fetches the interrupt. It then calls the ___, which is a sequence of instructions that handles the interrupt. The interrupt is handled, which generates a message to the user to notify them that the ink cartridge is empty. **[7]**

Question 9

0478/13 J24 ▪ Q9 ▪ 9 marks

A printer runs out of ink and needs a new ink cartridge. An interrupt is sent and a message is generated to notify the user that the ink cartridge is empty.

(b) Handling interrupts is one function of an operating system.

Give **two** functions of an operating system that relate to memory.

1. 2. **[2]**

Solution 9

(a) Mark scheme

- One mark for each correct term in the correct place.
- ▪ printer
- ▪ computer
- ▪ priority level
- ▪ fetch–decode–execute cycle
- ▪ interrupt queue
- ▪ higher
- ▪ interrupt service routine (ISR)

Solution 9

(b)

Mark scheme

- Example:
- ▪
- Memory management
- ▪
- Multitasking

Question 3

0478/12 M24 ▪ Q3 ▪ 10 marks

A computer has an operating system (OS).

(a) Complete the table by writing each missing OS function name and description.

Function name	Description
managing memory	
	allows application software to run on the computer
managing peripherals	

Question 3

[3]

Question 3

Function name	Description
managing memory	....
....	allows application software to run on the computer
managing peripherals	....

Question 3

	.....

[3]

Question 3

0478/12 M24 ▪ Q3 ▪ 10 marks

A computer has an operating system (OS).

(b)(i) State the purpose of an interrupt. **[1]**

(b)(ii) Identify **one** input device and **one** example of an interrupt that it can generate. **[1]**

(b)(iii) A processor is currently executing a program. The processor receives an interrupt.

Explain how the processor manages the current program and the interrupt. **[5]**

Solution 3

(a) Mark scheme

- One mark each:
- Function name
- Description managing memory
- Examples:
- ▪ allocates memory to processes
- ▪ prevents two processes accessing the same memory platform for running applications allows application software to run on the computer managing peripherals

Solution 3

- Examples:
- ▪ allocates data to buffers
- ▪ transmits data to hardware
- ▪ receives data from hardware

Solution 3

(b)(i)

Mark scheme

- To indicate that something requires the attention of the processor/OS/CPU

Solution 3

(b)(ii)

Mark scheme

- One mark for input device and matching interrupt:
- e.g.
- ▪ Keyboard
- Key pressed
- ▪ Mouse
- Mouse moved//button clicked

Solution 3

(b)(iii) Mark scheme

- Any five from:
- ▪ Interrupt is given priority
- ▪ ...and placed in interrupt queue
- ▪ Processor finishes current FE cycle for program
- ▪ Processor checks interrupt priority queue // processor checks for higher priority interrupt than program/process
- ▪ If lower priority processor runs next FDE cycle for program/process // if lower priority processor continues with program/process

Solution 3

- (if higher priority) processor stores current process/registers on stack
- Checks source of interrupt
- ... and calls the appropriate ISR
- ISR handles/resolves interrupt
- If there is another higher priority interrupt (than process) then repeat
- ... (otherwise) processor retrieves content of stack/registers/previous process (to continue with process from program)

Question 9

0478/11 N23 ▪ Q9 ▪ 10 marks

9 An interrupt is a type of signal that is used in a computer.

(a) State the name of the type of software that manages interrupts.

Question 9

(b) Describe how interrupts are used when a key is pressed on a keyboard.

Question 9

(c) Interrupts can be hardware based or software based.

A key press is one example of a hardware interrupt.

(i) Give **two** other examples of a hardware interrupt.

Question 9

[2]

(ii) Give **two** examples of a software interrupt.

Question 9

[2]

Solution 9

(a)

Mark scheme

- Any one from:
- –
- Operating system // Interrupt handler
- 1

Solution 9

(b) Mark scheme

- Any five from:
- e.g.
- —
- Key press generates the interrupt
- —
- Interrupt given a priority
- —
- Interrupt is sent to CPU

Solution 9

- –
- Interrupt is placed in a queue
- –
- CPU stops current task to check the queue/service the interrupt ...
- –
- ... using an interrupt service routine
- –
- If key press is highest priority the interrupt is processed
- 5

Solution 9

(c)(i) Mark scheme

- Any two suitable hardware example e.g.:
- —
- Moving the mouse
- —
- Clicking a mouse button
- —
- Plugging in a device
- —

Solution 9

- Paper jam in printer
- —
- Printer out of paper
- 2

Solution 9

(c)(ii) Mark scheme

- Any two suitable software examples e.g.:
- –
- Division by zero
- –
- Two processes accessing the same memory location
- –
- Null value
- 2

Question 4

0478/11 J23 ▪ Q4 ▪ 4 marks

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
software provides the services that the computer requires; an example is utility software
software is run on the operating system.
The system is run on the firmware, which is run on the [4] **[4]**

Solution 4

- One mark for each correct term in the correct place:
- ▪
- System
- ▪
- Application
- ▪
- Operating
- ▪

Solution 4

- Hardware
- 4