

HARDWARES MARKING SCHEME

1.

(a)	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 - 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
(b)	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 - 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 recording - Button pressed/motion detected causes a signal to be sent over a network to the smartphone	2
(c)(i)	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
(c)(iii)	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 ... 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

2.

(a)	1 mark for each correctly completed statement: • (LCD) displays/screens/lenses • gyroscope/accelerometer • direction/speed • digital cameras A headset can have one or two (LCD) displays/screens/lenses that output the image to the user. The headset has speakers that output surround sound to give a realistic experience. The user's head movements are detected using a sensor. This sensor is a gyroscope/accelerometer. The data is transmitted to a microprocessor that analyses the data to identify the direction/speed of movement. Some headsets use digital cameras that record the user's eye movements for analysis.	4
(b)	1 mark each to max 3: • The buffer is used as a temporary store for data going to the headset • Data is transferred into the buffer by the computer • Data is retrieved from the buffer by the headset • When the buffer is empty/full an interrupt is sent to the computer requesting more data/stopping further data being sent • When the headset has enough data/needs more data, an interrupt is sent by the headset to the computer to stop sending data from buffer	3
(c)	1 mark each to max 3: • EEPROM allows frequent/multiple read/write/erase operations • ... so the headset can take advantage of new features • ... without fully erasing the contents of the firmware in the headset first // can erase a particular byte or the whole EEPROM • ... without removing the chip(s)/firmware from the headset • ... the contents of the firmware in the headset can be changed by the user without technical expertise • Cheaper to manufacture so headset will be cheaper to purchase	3

3.

(b)(ii)	1 mark for correct port. 2 marks for explanation Port: USB / Universal Serial Bus Explanation: • A voltage change occurs when the drive is plugged in • The computer detects this voltage change • The code of the device is transferred to computer • ... the OS finds the code of the device in the list of devices • ... and loads the appropriate device driver	3
3(c)	1 mark for each bullet point (max 2) e.g. • DRAM requires constant refresh cycles unlike SRAM • DRAM has lower access speed than SRAM	2
3(d)(i)	1 mark for each bullet point (max 4) • The disc is spun at high speed • A laser is shone onto the disc to read / write • ... using optical head to move it into position • ... it follows the spiral track from the centre outwards • When writing the laser burns pits to represent the data • When reading the laser reflects from pits and lands • The reflection from a pit and a land is different • ... the differences are interpreted as 1 or 0	4
3(d)(ii)	1 mark for each bullet point (max 3) • The computer and optical disc reader/writer send and receive at different speeds • A buffer allows temporary storage of the data • ... so that the computer can transfer data to the buffer at the higher speed • ... and is not held up waiting for data to transfer // so the computer can carry on with other tasks • ... so the optical disc reader/writer is not overloaded • ... and so that data is transferred to optical disc reader/writer from the buffer at the slower rate	3

4.

!(a)	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	3
!(b)	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	1
!(c)	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	2

5.

!(a)	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 - DRAM has slower access times than SRAM	2
!(b)	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 - 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

6.

'(a)	1 mark for each bullet point (max 2). - Static RAM has faster access time ...because it does not need to be refreshed ...used on the CPU for improvement of CPU cache speed - Static RAM has lower	2
'(b)	1 mark for each bullet point (max 2) - EEPROM allows frequent / multiple read / write / erase operations ...which means that the contents of the firmware in the headset can be changed easily ...without fully erasing the contents of the firmware in the headset first	2
'(c)	1 mark for each bullet point (max 4) - The print instructions and data are sent by the laptop to a buffer (at laptop speed) - The data is transferred from the buffer to the printer (at printer speed) ...allowing user to continue using the laptop // and allowing processor to continue processing ...instead of waiting for relatively slower printer - When the buffer is empty an interrupt is sent to the laptop ...requesting more data	4
(d)	1 mark for naming a correct port 2 marks for matching justification - USB ...has fast data transfer speeds for data (to the headset) ...is a universal/popular cable // universal standard - HDMI ...allows video and audio to be transferred (on the same cable) ...convenience of HDMI as no need for two cables	3

7.

l(a)(i)	1 mark for each bullet point (max 2) e.g. • Secondary storage space is divided into file allocation units • Space on secondary storage is allocated to particular files • Maintains/creates directory structures • Specifies the logical method of file storage e.g. FAT or NTFS • Provides file naming conventions • Controls user access // implements access rights //implements password protection // Makes file sharing possible • Controls access to the file by other software • Specifies tasks that can be performed on a file e.g. open, close, delete, copy, create, move, etc • Allows searching for a file	2
(a)(ii)	1 mark for each bullet point (max 2) • To allow data to be retrieved / restored when lost • To automatically make a duplicate copy of data... • ...so the user does not have to remember to backup data • To make regular duplicate copies of data	2
l(b)(i)	1 mark for each bullet point (max 3) e.g. • Less of the teacher's storage space is used • ... so more student work can be stored • Transmission time is reduced • ... so the teacher does not have to wait as long for it to arrive • Bandwidth usage is reduced • ... so other transmissions are not adversely affected • Less data allowance is used on the teacher's email system	3
(b)(ii)	1 mark for each bullet point (max 3) • Run-Length Encoding // RLE • Repeated sequences of the same characters are replaced by • ... a single copy of the character • ... and a count of the number of characters	3