Question	Answer	Marks
1(a)(i)	**1 mark** for each description Pixel: • A single square of one colour • The smallest addressable element in an image File header: • Data about the bitmap image (e.g. number of colours)	2
1(a)(ii)	**1 mark** per bullet point for working, **1 mark** for answer Working: • 1024 × 512 = 524 288 pixels/bytes • 524288 / 1024 / 1024 Answer: 0.50 mebibytes	3
1(b)	**1 mark** for naming method, **1 mark** per description to **max 2** • Run-length encoding • Replace **sequences** of the **same colour** pixel • … with colour code and number of identical pixels	3
1(c)(i)	252	1

1(c)(ii)	**1 mark** per bullet point
	
	• Converting 15 to binary `0000 1111`
	• Method for addition
	• Final answer
	  `0010 0011`
	`+ 0000 1111`
	  `0011 0010`
	    `1   111`
		3

1(c)(iii)	**1 mark** per bullet point
	
	• Converting −10 to two's complement binary `1111 0110`
	• Adding values
	• Final answer `0001 1001`
	  `10 = 0000 1010`
	  `−10 = 1111 0110`
	
	  `0010 0011`
	`+ 1111 0110`
	  `0001 1001`
	  `11    11`
		3

Question	Answer	Marks
1(d)	**1 mark** per bullet point to **max 2** • The **formal and legal rights** to ownership // intellectual property rights • Protects against **unauthorised** reproduction of work • Provides for legal right of redress	**2**

Question	Answer	Marks
2(a)	**1 mark** for each correct line 	**4**
2(b)	**1 mark** per bullet point to **max 4** • memory management • file management • security management • hardware / device / peripheral / resources management • input/output management • process management • error checking and recovery • provision of a platform for software • provision of a user interface	**4**

Question	Answer	Marks
3(a)	**1 mark** for each completed statement The **Program Counter** holds the address of the next instruction to be loaded. This address is sent to the **Memory Address Register**. The **Memory Data Register** holds the data fetched from this address. This data is sent to the **Current Instruction Register** and the Control Unit decodes the instruction's opcode. The **Program Counter** is incremented.	5
3(b)	**1 mark** for each shaded set of values	6

Instruction address	ACC	Memory address				IX	Output
		365	366	367	368		
		1	3	65	66	0	
200	1						
201							
202							
203	2						
204		2					
205						2	
206	65						
207							A
208							
200	2						
201							
202							
203	3						
204		3					
205						3	
206	66						
207							B
208							
200	3						
201							
202							
209							

Question	Answer	Marks
3(c)(i)		1	1	0	1	0	1	0	0		1
3(c)(ii)	**1 mark** for correct answer The number is divided by 8 (and only whole number retained)	1

Question	Answer	Marks
4(a)	**1 mark** per bullet point to **max 2** • All computers are of equal status • Each computer provides access to resources and data // data is distributed • Computers can communicate and share resources • Each computer is responsible for its own security	2
4(b)	**1 mark** per bullet point to **max 2** per drawback • Reduced security // no central management of security • … only as secure as the weakest computer on the network • … each computer is at risk from viruses from other computers • No central management of backup • ... if the data from one computer is not backed up it is lost to all of them • No central management of files/software • … consistency may be difficult to maintain • … each computer may have different software from the others • Individual computers may respond slower • … because they are being accessed by other computers • In order to share files etc. all the computers involved need to be switched on • ... so the files etc. may not be always available	4

Question	Answer	Marks
4(c)(i)	**1 mark** for first 2 ticks, **1 mark** for last 2 (shaded)	2

Task	Performed by router	Not performed by router
Receives packets from devices	✓	
Finds the IP address of a Uniform Resource Locator (URL)		✓
Directs each packet to all devices attached to it		✓
Stores the IP and/or MAC address of all devices attached to it	✓	

Question	Answer	Marks
4(c)(ii)	**1 mark** per bullet point for justification up to **max 3** No mark for identification of wired/wireless Wired • Faster connection // higher bandwidth • …. needed as she is downloading/streaming large files • … less time waiting / less latency / fewer delays • **More** reliable / stable connection • … is less susceptible to issues with distance/walls/interference • **More** secure Wireless • Freedom of movement • … can move between different rooms with a mobile device and still receive/transmit data • … no need of a physical connection • Easily expanded if friends want to access the same network • Less cabling / expertise is needed • ... making the initial setup less expensive	3
4(d)	**1 mark** for identifying that she is using both. **1 mark** per bullet point for justification • using internet because sending data on **the infrastructure** • using WWW because accessing a **website** (that is stored on a web server operated by the webmail) that is part of the WWW	3

Question	Answer	Marks
5(a)	**1 mark** per bullet point to **max 2** • Definition: Microprocessor/microcontroller within a **larger system** // microprocessor/microcontroller that performs **one specific task** • Example: e.g. Embedded system in washing machine only controls the programs for the washing cycle // it is part of the washing machine but does not perform any other function within it	2
5(b)	**1 mark** for RAM, **1 mark** for ROM RAM: • **Store** the choices/wash program the user has entered // **stores** the data read from the sensors // **stores** the time left in the program // by example ROM: • **Store** the start-up instructions (for the washing cycles)	2
5(c)	**1 mark** per bullet point • The system uses feedback • The system causes the temperature to change // produces an action	2

Question	Answer	Marks
6(a)	Range (check)	1
6(b)	Presence (check)	1
6(c)	Existence (check)	1

Question	Answer	Marks
7(a)	**1 mark** per bullet point to **max 3** • Flat-file has more data redundancy • … because the same data is stored many times // data is stored in different tables which are linked • There is program-data dependence with flat-files • ... because any changes to the structure of the data means the programs that access that data have to be re-written • Flat-file has more data inconsistency // worse data integrity • ... because duplicated data might be stored differently //…because when data is updated in one place, it is not updated everywhere • It is not easy to perform **complex** searches /queries • … because a new program has to be written each time • Flat files could have a lack of privacy • … as user views cannot easily be implemented	3
7(b)(i)	**1 mark** for each correct example one-to-one • e.g. customer to payment details // customer to login details one-to-many • e.g. customer to order many-to-many • e.g. order to product // customer to product	3
7(b)(ii)	**1 mark** | Relationship	Tick (✓)
---	---
one-to-one	
one-to-many	
many-to-many	✓		1
7(b)(iii)	**1 mark** `CREATE DATABASE SHOPORDERS;`	1
7(c)	**1 mark** per item to **max 3** • table name • field name // attribute • data type • type of validation • Primary Key • Foreign Key • relationships	3

Question	Answer	Marks
8	**1 mark** per correct row	3

Statement	AND	NAND	NOR	XOR	OR
The output is 1 only when both inputs are 1	✓				
The output is 1 only when both inputs are different				✓	
The output is 1 only when both inputs are 0			✓		