<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>NOT B</td><td>1</td></tr>
<tr><td>1(b)</td><td>1 mark for first 4 rows correct; 1 mark for second 4 rows correct

<table>
<tr><th>A</th><th>B</th><th>C</th><th>X</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>1</td></tr>
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<tr><td>1</td><td>1</td><td>1</td><td>1</td></tr>
</table></td><td>2</td></tr>
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<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>1 mark each to max 2

• WAN covers a large geographical area and LAN covers a small geographical area
• LAN connections between devices are usually physical, whereas the WAN connections are often virtual
• A LAN has a high data transfer rate, whereas a WAN has a low data transfer rate
• The ownership of a LAN is private; the ownership of a WAN can be private or public
• LAN is usually more secure than a WAN because protection is easier to implement</td><td>2</td></tr>
<tr><td>2(b)(i)</td><td>1 mark each to max 2

• All computers are connected to at least one other device
• There are multiple routes between devices
• The computers can act as relays, passing packets on towards the final destination</td><td>2</td></tr>
</table>

Question	Answer	Marks
2(b)(ii)	**1 mark** each to **max 2** • If one line goes down there are more routes available • Improved security as not using one main line • No/fewer collisions • New nodes can be added without interruption or interfering with other nodes • More secure because data is sent over a dedicated connection	**2**
2(c)	**1 mark** each to **max 2** • Server performs **all** processes required by the task and/or data storage • Clients **only** sends requests to the server and displays the returned results	**2**
2(d)	**1 mark** each to **max 4** Examples: • Some students might only have one sort of connection on their device • Wired provides better performance for the student's device • ... for example, enabling faster access to university databases • There will be less interference if students connect via a cable • Students can transmit private/confidential data/work securely • ... for example, their final dissertation • Wireless connection means that the students can use their devices in different rooms/sites/outside/anywhere more freely // student devices can be portable • Wireless connection enables the students to bring multiple devices // bring their own devices // change devices	**4**
2(e)	**1 mark** for identification • IP address is made up of a network ID and a host ID **1 mark** each to **max 2** for description • Each device in a subnetwork has the same network ID // Each subnetwork has a different network ID • Every device **in each subnetwork** has a different host ID but the same network ID // the host ID uniquely identifies the device **within the subnetwork**	**3**

Question	Answer	Marks
3(a)	**1 mark** for each term • Resistive • Circuit • Capacitive • Change • Coordinates A **resistive** touchscreen has two layers. When the user touches the screen, the layers touch and a **circuit** is completed. A **capacitive** touchscreen has several layers. When the top layer is touched there is a **change/increase/decrease** in the electric current. A microprocessor identifies the **coordinates** of the touch.	**5**
3(b)	**1 mark** each to **max 3** Examples: • Scans the scene in real time • Identifies if there are faces in the image • Uses facial recognition • ... uses image recognition • ... takes each frame individually • ... analyses the pixels • ... stores pattern for a face • ... looks for patterns that match/come close to the pattern for a face • Camera focuses on the **pattern** identified	**3**
3(c)(i)	**1 mark** each • The amplitude is recorded a set number of times a second • Each (instance of an) amplitude is given a **corresponding** binary number • The binary number (of each amplitude) is saved in sequence	**3**
3(c)(ii)	**1 mark** each; **max 2** for rate and **max 2** for resolution Sampling rate • There are smaller 'gaps' in the sound wave // sound is recorded **more** often • Digital **waveform** is closer to the analogue **waveform** • The quantisation errors are smaller Sampling resolution • There are **more** bits per sample // a wider range of amplitudes can be stored • Each binary **amplitude**/note (in the digital recording) is closer to the analogue **amplitude**/note • Digital **waveform** is closer to the analogue **waveform** • The quantisation errors are smaller	**4**

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<tr><td>4(a)</td><td>1 mark for each bullet point. Mark in pairs. Max 2 for each description.

• Reduces data redundancy
• ... because linked tables mean that each data item is stored only once
• Reduces program-data dependency
• ... because the data is separate from the software so changes to the data do not require programs to be re-written
• Reduces data inconsistency // improves data integrity
• ... because by only storing data once it only needs to be updated once // changes in one table will automatically update in another // linked data cannot be entered differently in two tables
• Complex queries are easier to run
• Can provide different views
• ….so users can only see specific aspects of the database</td><td>4</td></tr>
<tr><td>4(b)</td><td>1 mark each

<table><tr><th>Term</th><th>Description</th></tr><tr><td>Entity</td><td>An object that data is stored about.</td></tr><tr><td>Tuple</td><td>A row of data in a table about one instance of an object.</td></tr><tr><td>Secondary key</td><td>An additional/alternative key used as well as the primary key to locate specific data // a candidate key that has not been chosen as a primary key.</td></tr><tr><td>Foreign key</td><td>A field in one table that is linked to a primary key in another table.</td></tr></table></td><td>4</td></tr>
<tr><td>4(c)</td><td>1 mark each

• Only 3 tables with appropriate identifiers (i.e. one table for customer, one for booking and one for car)
• Appropriate Primary key in each table underlined
• Booking table includes Primary key from car and Primary key from customer as Foreign keys
• All original fields are in correct tables

Example answer:
BOOKING(BookingID, CarRegistration, CustomerID, StartDate, EndDate)
CAR(CarRegistration, CarModel, CarColour)
CUSTOMER(CustomerID, CustomerFirstName, CustomerLastName, EmailAddress, TelephoneNumber)</td><td>4</td></tr>
</table>

Question	Answer	Marks
4(d)(i)	**1 mark** each to **max 2** • Length check: the registration number must be **6 characters** long • Format check: the registration number must be in the format **letter-digit-digit-digit-letter-letter** • Type check: the registration number must be **alphanumeric**	**2**
4(d)(ii)	**1 mark** each • Visual check: **Manually** compare the registration number entered with the source document • Double entry: Enter the registration number twice and **the computer compares** to check they are the same	**2**
4(d)(iii)	The registration number on the original document might be in the correct format but may be the incorrect registration number for that car.	**1**

Question	Answer	Marks
5(a)(i)	**1 mark** each to **max 2** • Programmer can test sections of the code without every part working / being written • Programmer can debug in real time • … so that errors can be fixed and the program continued from that point • The effect of any changes made by the programmer can be seen immediately • To avoid dependent errors	**2**
5(a)(ii)	**1 mark** each to **max 3** • The compiler produces an executable file • ... so the user cannot access / edit / sell the code • ... and users do not need the translator to run the game • The game can be compiled for different hardware specifications • ... and then used to generate more income for the programmer • The program can be **tested** multiple times without having to retranslate each time	**3**

Question	Answer	Marks
5(b)	**1 mark** for appropriate licence; **1 mark** for each point to **max 3** • Commercial software licence • User has to pay for the product so the programmer can gain an income • Enables the program to be **copyrighted** • ... so the user cannot **legally** edit the program // the programmer retains control over product • … and can take legal action against people who attempt to **illegally** copy it /sell it on • Shareware licence • Enables the program to be **copyrighted** • The user cannot **legally** edit the program so the developer retains control over product • User can try the program for free and then pay for the full game which allows the programmer to gain an income • so more people can experience it and therefore be more likely to buy it	**4**

Question	Answer	Marks
6(a)	**1 mark** each to **max 5** • The sender hashes **the document** • ... to produce a digest • The sender encrypts the digest to create the digital signature • The message and the signature are sent to the receiver • The receiver decrypts the signature to reproduce the digest • The receiver uses the same hashing algorithm on the document received to produce a second digest • The receiver compares this digest with the one from the digital signature • If both of the receiver's digests are the same the document is authentic	**5**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>6(b)</td><td>1 mark each for identification and appropriate description of 2 pieces of software, max 2
<table>
<tr><th>Type of software</th><th>Description</th></tr>
<tr><td>Antivirus</td><td>• scans the computer for viruses and checks against a stored database of viruses, that needs to be updated regularly and then deletes / quarantines them
• compares downloaded files to a database of known viruses and prevents the download continuing</td></tr>
<tr><td>Antispyware</td><td>• scans the computer for spyware and checks against a stored database of viruses, that needs to be updated regularly and then deletes / quarantines them
• compares downloaded files to a database of known spyware and prevents the download continuing.</td></tr>
<tr><td>Firewall</td><td>• monitors incoming and outgoing traffic and compares it to criteria that are set by the user such as through a whitelist/blacklist/identifying allowed / blocked IP addresses
• compares incoming and outgoing traffic to criteria blocks those that do not match criteria</td></tr>
<tr><td>Antimalware</td><td>• scans the computer for viruses and checks against a stored database of viruses, that needs to be updated regularly and then deletes / quarantines them
• compares downloaded files to a database of known viruses and prevents the download continuing</td></tr>
</table></td><td>2</td></tr>
</table>

Question	Answer	Marks
7(a)	**1 mark** for each correct line **Description** / **Denary value** The smallest integer that can be represented in 8-bit two's complement. → −128 The largest integer that can be represented in 8-bit two's complement. → 127 The largest unsigned integer that can be represented in 8 bits. → 255 −127 127 −255 −128 −256 256 128 255	**3**
7(b)	**1 mark** each to **max 4** • The **system clock** gives out **timing** signals • … which are sent on the **control bus** • …to **synchronise** the other system components • The **Control Unit** initiates data transfer • …by generating signals that are sent on the **control bus** to other components	**4**

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7(c)</td><td>1 mark for each Register transfer notation

<table><tr><th>Stage description</th><th>Register transfer notation</th></tr><tr><td>The Program Counter (PC) is incremented</td><td>PC ← [PC] + 1</td></tr><tr><td>The data in the address stored in the Memory Address Register (MAR) is copied to the Memory Data Register (MDR)</td><td>MDR ← [[MAR]]</td></tr></table></td><td>2</td></tr>
</table>