<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>1(a)</td><td>1 mark for one or two correct ticks, 2 marks for three correct ticks.

<table>
<tr><th>Action</th><th>Accuracy increases</th><th>Accuracy decreases</th><th>Accuracy does not change</th></tr>
<tr><td>Change the sampling rate from 40 kHz to 60 kHz.</td><td>✓</td><td></td><td></td></tr>
<tr><td>Change the duration of the recording from 20 minutes to 40 minutes.</td><td></td><td></td><td>✓</td></tr>
<tr><td>Change the sampling resolution from 24 bits to 16 bits.</td><td></td><td>✓</td><td></td></tr>
</table></td><td>2</td></tr>
<tr><td>1(b)</td><td>1 mark for answer; 1 mark for working.

Working:
Size = 50KHz * (20 × 60) * 16 bits
= 50 000 * 1200 * 16 bits // 50 000 *1200 * 2 bytes
= 960 000 000 bits
= 120 000 000 bytes
= 120 000 kilobytes
= 120 megabytes

Answer = 120 megabytes</td><td>2</td></tr>
<tr><td>1(c)</td><td>1 mark for purpose (max 2):

Purpose:
• to act as temporary storage // to store (downloaded) data
• ... before it is used by the receiving device
• ... to allow processes / devices to operate at different speeds // independently of each other

1 mark for each example (max 1):
Examples:
• printer buffer used when data is transferred from a computer to a printer
• video buffer when streaming videos
• keyboard buffer when performing data entry</td><td>3</td></tr>
</table>

<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>1 mark for each correct answer.

<table>
<tr><th>Item</th><th>Answer</th></tr>
<tr><td>a suitable field for the primary key in COMPANY</td><td>CompanyID</td></tr>
<tr><td>a candidate key in TELESCOPE</td><td>SerialNumber // TelescopeID</td></tr>
<tr><td>the degree of relationship between TELESCOPE and PHOTOGRAPH</td><td>1:M / 1 to many</td></tr>
</table>
</td><td>3</td></tr>
<tr><td>2(b)</td><td>Logical schema</td><td>1</td></tr>
<tr><td>2(c)</td><td>1 mark for each correctly completed missing part:

<pre>SELECT <u>COUNT</u> (<u>TelescopeID</u>)
FROM TELESCOPE
WHERE <u>CompanyID</u> LIKE <u>'HW%'</u>;</pre></td><td>4</td></tr>
<tr><td>2(d)</td><td>1 mark for each bullet point:

• ALTER TABLE PHOTOGRAPH
• ADD Resolution TEXT;

<pre>ALTER TABLE PHOTOGRAPH
ADD Resolution TEXT / VARCHAR(11);</pre></td><td>2</td></tr>
<tr><td>2(e)</td><td>1 mark for each correctly completed term;

The <u>bit depth</u> of a bitmap image is the number of bits that are used to store each pixel.

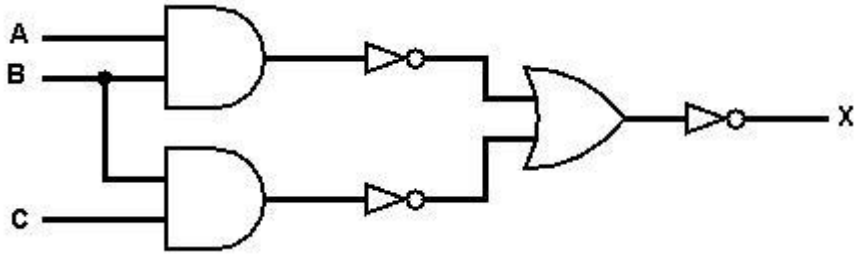
Metadata about the image is stored in the <u>header</u> of the file.</td><td>2</td></tr>
<tr><td>2(f)</td><td>1 mark for each bullet point (max 2):

• allows the user to enter criteria
• searches for the data that meets the entered criteria
• organises the results to be displayed to the user</td><td>2</td></tr>
</table>

Question	Answer	Marks
3	**1 mark** for each correct line: **OS Management task** — **Description** hardware management → installs programs for devices connected to external ports security management → validates user and process authenticity memory management → dynamically allocates memory to processes process management → allows processes to transfer data to and from each other marks unallocated file storage for availability	**4**

Question	Answer	Marks
4(a)(i)	**1 mark** for each register: MAR: • **holds** address in memory from which data will be read / to which data will be written MDR: • **holds** the data/instructions which has been read from or is to be written to the address in the MAR	**2**
4(a)(ii)	after completion of the execute stage // before the cycle begins	**1**
4(b)	**1 mark** for each bullet point (**max 2**): • synchronise operations • ... by creating timing signals • to keep track of the date and time / timestamp files • to process operations in the correct order / sequence	**2**

Question	Answer	Marks
4(c)	**1 mark** for identification of a correct upgrade: **1 mark** for a corresponding explanation: Examples: • increase quantity of RAM • ... so allowing more applications to reside in memory at the same time, saving disk access times • increase the size of cache memory • ... so that the CPU can continue working without waiting for data • increase clock speed • ... so that more instructions are performed in a time period • increase the number of processors / cores • ... so that more instructions are performed in parallel	**2**

Question	Answer	Marks
5(a)	**1 mark** for each bullet point: • NOT (A AND B) • NOT (B AND C) • NOT(NOT(A AND B) OR NOT(B AND C))  	**3**
5(b)	**1 mark** for each set of highlighted rows. **P** **Q** **R** **Y** 0 0 0 0 0 0 1 0 0 1 0 1 0 1 1 1 1 0 0 0 1 0 1 0 1 1 0 1 1 1 1 0	**2**

Question	Answer	Marks
6(a)(i)	**1 mark** for each set of highlighted rows:	**4**

Instruction address	ACC	IX	Memory address					Output
			100	101	110	111	112	
			1	0	97	98	97	
75		0						
76	1							
77								
78								
79	97							
80	65							
81								
82								
83	1							
84								
85				1				
86								
87	2							
88			2					
89		1						
90								
76								
77								
78								
91	1							
92	49							
93								1
94								

6(a)(ii)	**1 mark** for each bullet point: • To allow for **re-locatable** code • ... because all (target) addresses can be specified by the base address + offset	**2**

Question	Answer	Marks
6(b)(i)	`0000 0100`	**1**
6(b)(ii)	`1101 1111`	**1**
6(b)(iii)	`0010 0111`	**1**
6(c)	**1 mark** for a correct name: • input and output of data • arithmetic operations • unconditional and conditional instructions • compare instructions	**1**

Question	Answer	Marks
7(a)	**1 mark** for each correct answer: **Answer** The name of device A that allows the laptop to connect to the internet: Router A type of cloud, X: Public (cloud) An example of an application, B, that can run on the cloud,: Email / Graphics / Word processor / Spreadsheet / Game / Database, etc.	**3**
7(b)	**1 mark** for a correct advantage: • not fixed to a single location • allows access in remote / rural areas **1 mark** for each correct disadvantage (**max 2**): • high latency / lag / slow to connect • more expensive than wired methods, as need extra equipment • signal is affected by **bad weather** • the transmission speed is slower than fixed line broadband • direct line of sight needed	**3**
7(c)(i)	**1 mark** for each bullet point (**max 2**) Examples: • improves security • reduces congestion • allows extension of the network / devices attached • aids day-to-day management • improves performance	**2**

Question	Answer	Marks
7(c)(ii)	**1 mark** for each correct answer: • network ID = 10 • host ID = 4	**2**

Question	Answer	Marks
8(a)(i)	**1 mark** for each bullet point (**max 2**): • to allow users to customise the code • to allow errors to be reported / identified / fixed by users • to allow additional features to be added to the code • to allow for collaboration	**2**
8(a)(ii)	**1 mark** for each correct point (**max 2**) Example: • enables the program to be copyrighted • prevents illegal changes to the program / protects the source code • prevents illegal copies of the program being made • a fee can be charged for the program	**2**
8(b)	**1 mark** for a correct economic impact and **1 mark** for corresponding description Example: • reduce costs to the garage • ... because less time taken for diagnosis • increase profits for the garage • ... as technicians spend more time repairing, so completing more jobs in a day • decrease costs passed to customer • ... so garage may gain customers • profit margins can be reduced • ... because program may be expensive to buy / maintain / update	**2**

Question	Answer	Marks
9(a)(i)	93	**1**
9(a)(ii)	147	**1**
9(b)	**1 mark** for each correct benefit (**max 2**) Examples: • straightforward to convert to / from BCD and denary • ... so it is less complex to encode and decode for programmers • easier for digital equipment use BCD to display output information • can represent monetary values exactly	**2**

Question	Answer	Marks
10(a)	**1 mark** for each bullet point: • to ensure the system operates with the given criteria • ... by enabling system output to affect subsequent system input • ... thus allowing conditions to be <u>automatically</u> adjusted	**3**
10(b)(i)	**1 mark** for identification of a suitable sensor **1 mark** for corresponding justification Example: • sound sensor • if a sound occurs inside the car the alarm is activated • infra-red sensor • senses the heat of person in the car / infra-red beams are broken • pressure sensor • an intruder sits in the driver's seat	**2**
10(b)(ii)	**1 mark** for each bullet point (**max 3**): • the embedded system is **built into** / integrated (into the car alarm) • combination of hardware and software designed for a **specific function** • must have a processor, memory and input / output • The system is **not easily changed**/updated by the car owner	**3**