3.3 Hardware – Data Storage
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Question	Answer	Marks
8(a)	Any **two** from: – Data is stored on platters – (Platters) are divided into tracks and sectors – Has components that are spun – Data is read/written using a read/write arm – Data is read/written using electromagnets – Magnetic field determines the binary value – It is non-volatile	**2**
8(b)	Any **three** from: – Flashes data onto chips – Uses transistors – Uses NAND/NOR technology – Uses control gates – Uses flow gates – Controls the flow of electrons – It can be volatile or non-volatile	**3**
8(c)	**One** mark for an example in each storage type e.g.: Magnetic – HDD – Magnetic tape – Floppy disk – Magnetic strip Solid state – SSD – USB drive – SD card – RAM Optical – CD – DVD – Blu-ray	**3**

Question	Answer	Marks
13(a)(i)	– C	**1**
13(a)(ii)	Any **one** from: – Directly accessed by the CPU – Has both volatile and non-volatile storage	**1**
13(b)	**One** mark for each correct term in the correct order: – Random access memory (RAM) – Hard disk drive (HDD) – Pages – Random access memory (RAM) – Virtual memory // Hard disk drive (HDD)	**5**

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Question	Answer	Marks
6(a)	– B	**1**
6(b)	**Four** from e.g.: – The data can be accessed from any location – … meaning that employees can work from anywhere with a connection – The **hardware** is **owned/maintained** by a **third party** – … meaning that the company are not responsible for maintaining // meaning the company aren't responsible for its security – Can increase the storage needed easily – … without needing to buy new hardware – Do not need to house the hardware needed – … costs can be saved on the space saved for this – Cloud system will back up the data – … meaning the company does not need to do this	**4**
6(c)	**Two** from e.g.: – Internet connection is needed/needs to be stable … – … and if this is not available/unstable the data cannot be accessed – Employees could be pressured to work outside of hours … – … as they can access the data from any location	**2**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>9(a)</td><td>One mark for each correct type:

<table>
<tr><th>Type of secondary storage</th><th>Statement</th></tr>
<tr><td>optical</td><td>data is stored using pits and lands</td></tr>
<tr><td>solid-state</td><td>data is stored using control gates and floating gates</td></tr>
<tr><td>magnetic</td><td>data is stored using electromagnets</td></tr>
<tr><td>optical</td><td>data is stored using a laser</td></tr>
<tr><td>magnetic</td><td>data is stored on a platter that is divided into tracks and sectors</td></tr>
</table></td><td>5</td></tr>
<tr><td>9(b)</td><td>Four from:
– Primary storage is directly accessible by the CPU
– … whereas secondary storage is not directly accessible by the CPU

– Primary storage stores the data that is currently in use/for booting the system
– … whereas secondary storage stores user's files/data/operating system/application software

– Primary storage normally has a small capacity
– … whereas secondary storage normally has a larger capacity

– Some parts of primary storage are volatile
– … whereas secondary storage is non volatile

– Some parts of primary storage the data cannot be changed
– … whereas data in secondary storage can be changed

– Primary storage has faster access speeds to data
– … whereas secondary storage has slower access speeds to data</td><td>4</td></tr>
</table>

Question	Answer	Marks
3(a)	**One** mark for each correctly circled storage device: • Compact disk (CD) • Solid-state drive (SSD) • Hard disk drive (HDD)	3
3(b)	• C	1

Question	Answer	Marks
10	Any **four** from: • The secondary storage / hard drive can be partitioned to create the virtual memory • … and page B sent to the virtual memory … • … which makes space for page D in RAM • … Once page A / C / D / another page is not required / has been processed • … page B can be sent from the virtual memory back to RAM when it is required	4

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Question	Answer	Marks
3(a)	**One** mark each: 8 bytes = **16** nibbles 512 KiB = **0.5** MiB 4 GiB = **4096** MiB 1 EiB = **1024** PiB	**4**
3(b)	Any **three** from: • Currently running data • Currently running (application) software • Currently running instructions • Currently running parts of OS • Currently running utility software	**3**
3(c)	Any **two** from: • For non-volatile/permanent/long-term storage of files/data • To store data that is not currently required by the **CPU** • To store data to transfer it to another computer	**2**

Question	Answer	Marks
3	**One** mark for each correct row	5

Statement	Component		
	RAM (✓)	**Internal SSD (✓)**	**USB flash memory drive (✓)**
it is a type of primary storage	✓		
it is volatile	✓		
it uses NAND and NOR technology		✓	✓
it does **not** have any moving parts	✓	✓	✓
it is **not** directly connected to the Central Processing Unit (CPU)		✓	✓

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Question	Answer	Marks
3(a)	Any **one** from e.g.: • SD card • USB flash memory drive • Random access memory // RAM	**1**
3(b)	Any **three** from: • Laser is shone at the disk • An (arm/head) moves the **laser** across the surface of the disk • The **laser** burns **pits** onto the surface of the disk • The **laser** is used to **read the pits and lands** on the surface of the disk • The **reflected** light from the laser shining on the disk is **captured** (by a sensor)	**3**
3(c)(i)	Any **three** from: • It is **small** in size // compact // lightweight // portable • It has low power consumption • It runs quietly • It runs at a cool temperature • It is robust when dropped // durable • Fast **access**/**read**/**write** speed • High capacity • Not affected by magnets	**3**
3(c)(ii)	• Operating system • Application software // by example • Utility software // by example	**2**

Question	Answer	Marks
11(a)	**One** mark for each of the correct terms, in the correct place • buffer • nozzles • liquid • thermal bubble • interrupt	**5**
11(b)	Any **three** from e.g.: • Monitor // screen • Speaker • Headphones • Light // LED • (2D/3D) cutter • DLP // LCD projector • Actuator	**3**
11(c)	Any **two** from e.g.: • Keyboard • Mouse // trackerball • Microphone • (2D/3D) scanner • Barcode reader • QR code reader • **Digital** camera // webcam • Interactive whiteboard • Touchscreen • Sensor	**3**

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>7(a)</td><td>Three from:

• CD
• DVD
• Blu-ray</td><td>3</td></tr>
<tr><td>7(b)</td><td>One mark for each correct row

<table>
<tr><th rowspan="2">Statement</th><th colspan="3">Type of storage</th></tr>
<tr><th>Magnetic (✓)</th><th>Optical (✓)</th><th>Solid state (✓)</th></tr>
<tr><td>this storage has no moving parts</td><td></td><td></td><td>✓</td></tr>
<tr><td>this storage uses a laser to read and write data</td><td></td><td>✓</td><td></td></tr>
<tr><td>this storage uses a read/write head</td><td>✓</td><td>✓</td><td></td></tr>
<tr><td>this storage burns pits onto a reflective surface</td><td></td><td>✓</td><td></td></tr>
<tr><td>this storage uses NAND and NOR technology</td><td></td><td></td><td>✓</td></tr>
<tr><td>this storage stores data in tracks and sectors</td><td>✓</td><td>(✓)</td><td></td></tr>
</table></td><td>6</td></tr>
</table>

Question	Answer	Marks
7(a)	**One** mark per correct storage, **two** marks for justification. – Secondary – It is non-volatile storage – It is not directly accessed by the CPU	3
7(b)	Any **four** from: – Uses flash memory – Data is flashed onto (silicon) chips – Uses NAND/NOR technology // Can use flip-flops – Uses transistors/control gates/floating gates … – … to control the flow of electrons – It is a type of EEPROM technology – When data is stored the transistor is converted from 1 to 0 / 0 to 1 – Writes (and reads) sequentially	4

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12)

Answer	Marks
One mark for each correct row.	6

Statement	HDD (✓)	SSD (✓)	USB flash memory drive (✓)
it has no moving parts		✓	✓
it is non-volatile	✓	✓	✓
it can use NAND gates to store data		✓	✓
it uses magnetic properties to store data	✓		
it has the smallest physical size			✓
it has the slowest read/write speeds	✓		

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<table>
<tr><th>Question</th><th>Answer</th><th>Marks</th></tr>
<tr><td>2(a)</td><td>One mark per each correct row.

<table>
<tr><th>Statement</th><th>Magnetic (✓)</th><th>Solid state (✓)</th><th>Optical (✓)</th></tr>
<tr><td>no moving parts are used to store data</td><td></td><td>✓</td><td></td></tr>
<tr><td>pits and lands are used to store data</td><td></td><td></td><td>✓</td></tr>
<tr><td>data is stored on platters</td><td>✓</td><td></td><td></td></tr>
<tr><td>flash memory is used to store data</td><td></td><td>✓</td><td></td></tr>
<tr><td>parts are rotated to store data</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>data can be stored permanently</td><td>✓</td><td>✓</td><td>✓</td></tr>
</table></td><td>6</td></tr>
<tr><td>2(b)(i)</td><td>Any one from:
– Hard disk drive // HDD
– Magnetic tape</td><td>1</td></tr>
</table>

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Question	Answer	Marks
2(b)(ii)	Any **one** from: – CD – DVD – Blu-ray disk	**1**
2(b)(iii)	**One** for type of storage, **two** for matching justification from: – Magnetic // HDD – (Web server) is likely to receive many requests a day – (Web server) will likely need to store a lot of data and magnetic is high capacity – Magnetic is **cheaper** to buy for **storage per unit** than solid state – Magnetic is capable of more of read/write requests **over time** // has more **longevity** // SSD has more limited number of read/write requests (before it is no longer usable) – No requirement for it to be portable, so moving parts does not matter – Solid-state // SSD – (Web server) is likely to receive many requests a day – (Web server) will likely need to store a lot of data and solid-state is high capacity – Solid-state is more energy efficient – Solid-state runs cooler so will not overheat – Solid state has faster read/write speeds to handle volume of traffic	**3**
2(c)	Any **three** from: – Data is flashed onto (silicon) chips – Uses NAND/NOR technology // can use flip-flops – Uses transistors/control gates/floating gates … – … to control the flow of electrons – It is a type of EEPROM technology – When data is stored the transistor is converted from 1 to 0 / 0 to 1 – Writes (and reads) sequentially	**3**

13)

(i)	– Magnetic – Solid state – Optical	**3**
(ii)	Any **four** from: – It has platters – Platters/disk divided into tracks – Platter/disk is spun – Has a read/write arm that moves across storage media – Read/writes data using **electromagnets** – Uses magnetic fields to control magnetic dots of data – Magnetic field determines binary value	**4**