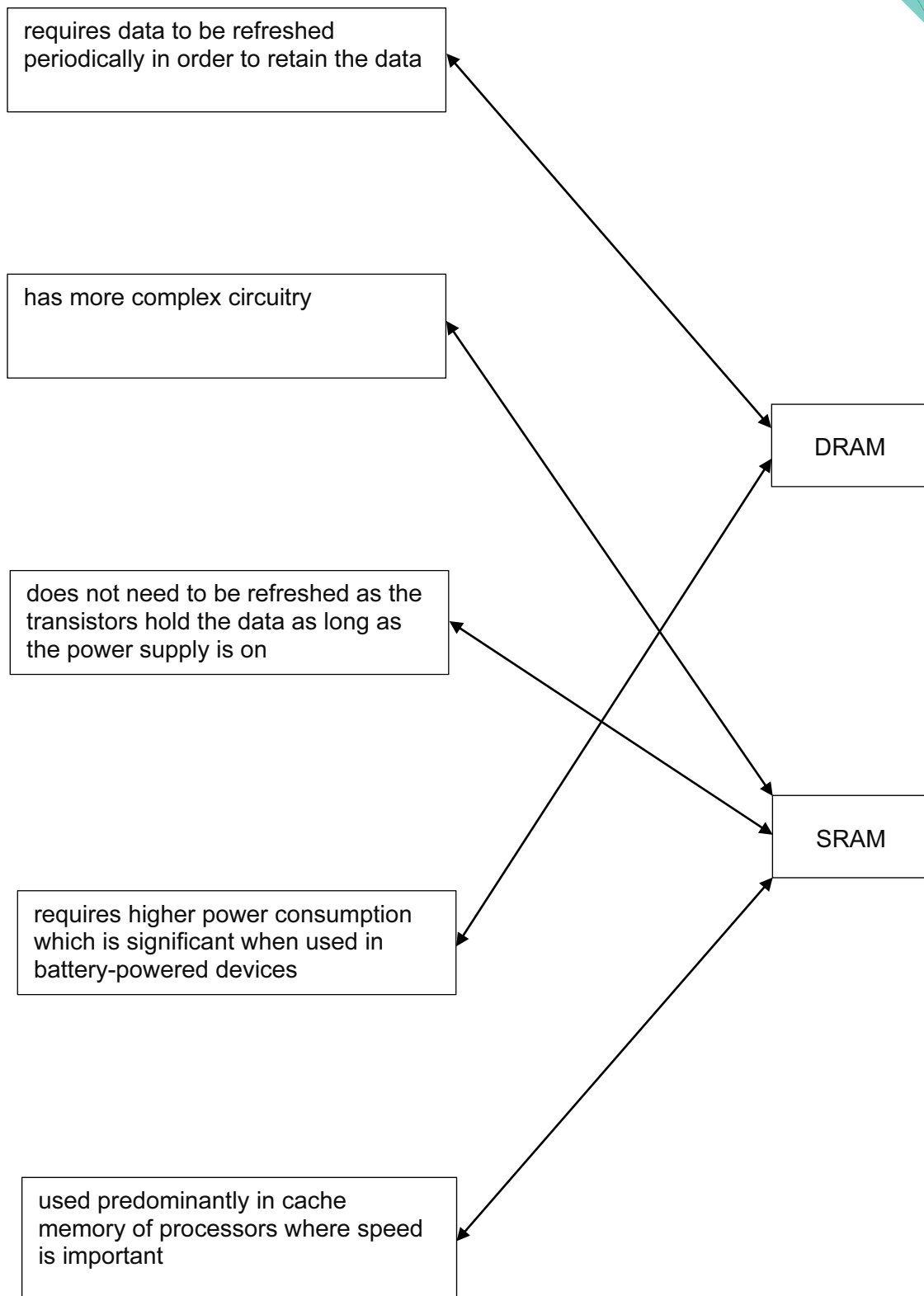


QUESTION 3.



4 (a)



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(b) maximum of **two marks** for RAM and maximum of **two marks** for ROM

RAM

- loses contents when power turned off/volatile memory/temporary memory
- stores files/data/operating system currently in use
- data can be altered/deleted/read from and written to
- memory size is often larger than ROM

ROM

- doesn't lose contents when power turned off/non-volatile memory/permanent memory
- cannot be changed/alterd/deleted/read only
- can be used to store BIOS/bootstrap

[3]

(c) **one** mark for DVD-RAM, **one** mark for flash memory.

DVD-RAM

- data is stored/written using lasers/optical media
- DVD-RAM uses phase changing recording, in which varying laser intensities cause targeted areas in the phase change recording layer to alternate between an amorphous and a crystalline state.
- uses a rotating disk with concentric tracks
- allows read and write operation to occur simultaneously

flash memory

- most are NAND-based flash memory
- there are no moving parts
- uses a grid of columns and rows that has two transistors at each intersection
- one transistor is called a floating gate
- the second transistor is called the control gate
- memory cells store voltages which can represent either a 0 or a 1
- essentially the movement of electrons is controlled to read/write
- not possible to over-write existing data; it is necessary to first erase the old data then write the new data in the same location

[2]

QUESTION 4.



2 (a) Any **two** from:

- DRAM has to be refreshed / charged
// SRAM does not request a refresh
- DRAM uses a single transistor and capacitor
// SRAM uses more than one transistor to form a memory cell
// SRAM has more complex circuitry
- DRAM stores each bit as a charge
// SRAM each bit is stored using a flip-flop / latch
- DRAM uses higher power(because it requires more circuitry for refreshing)
// SRAM uses less power (no need to refresh)
- DRAM less expensive (to purchase / requires fewer transistors)
// SRAM is more expensive (to buy as it requires more transistors)
- DRAM has slower access time / speed (because it needs to be refreshed)
// SRAM has faster access times
- DRAM can have higher storage / bit / data density
// SRAM has lower storage / bit / data density
- DRAM used in main memory
// SRAM used in cache memory

[2]

Page 4	Mark Scheme
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(b) (i) Any **two** from

- The hardware is unusable without an OS // hides complexity of hardware from user
- Acts as an interface / controls communications between user and hardware / hardware and software
- Provides software platform / environment on which other programs can be run [2]

(ii) Any **two** from:

- Process / task / resource management
- Main memory management
- Peripheral / hardware / device management
- File / secondary storage management
- Security management
- Provision of a software platform / environment on which other programs can be run – only if not given in part (b)(i)
- Interrupt handling
- Provision of a user interface run – only if not given in part (b)(i) [2]

(c) Any **two** from:

- A DLL file is a shared library file
- Code is saved separately from the main .EXE files
- Code is only loaded into main memory when required at run-time
- The DDL file can be made available to several applications (at the same time) [2]

QUESTION 5.

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6 (a) **ONE** mark for each difference from the bullet points below.

- RAM loses content when power turned off / volatile memory / temporary memory
ROM does not lose content when power turned off / non-volatile memory / permanent memory
- Data in RAM can be altered / deleted / read from and written to
ROM is read only / cannot be changed / altered / deleted
- RAM stores files / data / operating system currently in use
ROM is used to store BIOS / bootstrap / pre-set instructions

[2]

(b) **THREE** from:

- DRAM has to be refreshed / charged
// SRAM does not request a refresh
- DRAM uses a single transistor and capacitor
// SRAM uses more than one transistor to form a memory cell
// SRAM has more complex circuitry
- DRAM stores each bit as a charge
// SRAM each bit is stored using a flip-flop/latch
- DRAM uses higher power (because it requires more circuitry for refreshing)
// SRAM uses less power (no need to refresh)
- DRAM less expensive (to purchase / requires fewer transistors)
// SRAM is more expensive (to buy as it requires more transistors)
- DRAM has slower access time / speed (because it needs to be refreshed)
// SRAM has faster access times
- DRAM can have higher storage/bit/data density
// SRAM has lower storage/bit/data density
- DRAM used in main memory
// SRAM used in cache memory

[3]

QUESTION 6.



Question	Answer	Marks																		
6(a)(i)	$MAR \leftarrow [PC]$ $PC \leftarrow PC + 1$ $MDR \leftarrow [MAR]$ $CIR \leftarrow [MDR]$	3																		
6(a)(ii)	1 mark from: - The contents of the MAR is an address, it is the contents of that address which is transferred to MDR - The contents of the address pointed to by the MAR is transferred to the MDR	1																		
6(b)	1 mark per bullet point to max 2 - A signal from a source / device - Telling the processor its attention is needed	2																		
6(c)	1 mark per row <table border="1"> <thead> <tr> <th>Statement</th><th>DRAM</th><th>SRAM</th></tr> </thead> <tbody> <tr> <td>Does not need to be refreshed as the circuit holds the data while the power supply is on</td><td></td><td>✓</td></tr> <tr> <td>Mainly used in cache memory of processors where speed is important</td><td></td><td>✓</td></tr> <tr> <td>Has less complex circuitry</td><td>✓</td><td></td></tr> <tr> <td>Requires higher power consumption under low levels of access, which is significant when used in battery-powered devices</td><td>✓</td><td></td></tr> <tr> <td>Requires data to be refreshed occasionally so it retains the data</td><td>✓</td><td></td></tr> </tbody> </table>	Statement	DRAM	SRAM	Does not need to be refreshed as the circuit holds the data while the power supply is on		✓	Mainly used in cache memory of processors where speed is important		✓	Has less complex circuitry	✓		Requires higher power consumption under low levels of access, which is significant when used in battery-powered devices	✓		Requires data to be refreshed occasionally so it retains the data	✓		5
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QUESTION 7.



Question	Answer	Marks
4(a)(i)	1 mark per bullet point to max 3 • The microphone has a diaphragm / ribbon (accept equivalent) • The incoming sound <u>waves</u> cause vibrations (of the diaphragm) • ...causing a coil to move past a magnet (dynamic microphone) // changing the capacitance (condenser microphone) // deforms the crystal (crystal microphone) etc. • An electrical signal is produced	3
4(a)(ii)	1 mark per bullet to max 3 • The revolving drum is initially given an electrical charge • A laser beam (bounces off moving mirrors) <u>scans back and forth</u> across the drum • ...discharging certain points (i.e. 'drawing' the letters and images to be printed as a pattern of electrical charges) • The drum is coated with oppositely charged toner (which only sticks to charged areas) • The drum rolls over electro-statically <u>charged</u> paper // Electro-statically <u>charged</u> paper is fed (towards the drum) • The 'pattern' on the drum is transferred to the paper • The paper is passed through the fuser to seal the image • The electrical charge is removed from the drum // the excess toner is collected	3
4(b)	1 mark per bullet to max 2 • Stores all the scan lines for an entire frame // displays / records all the frame data at the same time // not split into fields • Complete frames are displayed <u>in sequence</u> • The rate of picture display is the same as the frame rate.	2



Question	Answer	
4(c)	1 mark per bullet to max 4 • DRAM has to be refreshed / charged and SRAM does not require a refresh • DRAM uses a single transistor and capacitor and SRAM uses more than one transistor • DRAM stores each bit as a charge and in SRAM each bit is stored using a flip-flop/latch • DRAM requires higher power consumption under low levels of access, (which is significant when used in battery-powered devices because it requires more circuitry for refreshing) // SRAM uses less power (no need to refresh) • DRAM less expensive to purchase (requires fewer transistors) // SRAM is more expensive to buy (as it requires more transistors) • DRAM has slower <u>access</u> time/speed (because it needs to be refreshed) // SRAM has faster <u>access</u> times • DRAM can have higher storage/bit/data <u>density</u> // SRAM has lower storage/bit/data <u>density</u> • DRAM used in main memory and SRAM used in cache memory	
4(d)(i)	1 mark for correct answer Formal or legal recognition of ownership of the program // Formal or legal restriction / permissions on use of the program // The intellectual property rights to the program	1
4(d)(ii)	1 mark per bullet point • She does not wish to release the source <u>code</u> • She does not want anyone to be able to edit / modify / share the source code/program • She wants to make money from the program	2



Question	Answer
4(d)(iii)	1 mark for a <u>name and a description</u> of each licence to max 2 Commercial Software • The program is purchased for a fee • It restricts the number of users/possible time period for use // Limited number of installations allowed // Software key needed to install • Source code not provided // source code protected / cannot be edited • Anyone can purchase/download if agree to the terms Shareware • The program is free for a trial period // The (free) program may have limited functionality // Need to purchase / enter details after trial • Users do not have access to the source code // source code may not be edited • Users may re-distribute the software. Freeware • There is no charge for the software • The software could still be copyrighted • She can set her own restrictions on what a user can do with the program

QUESTION 8.



Question	Answer																
6(a)(i)	1 mark for touchscreen being both 1 mark for remaining 3 devices <table border="1"> <thead> <tr> <th>Device</th><th>Input</th><th>Output</th></tr> </thead> <tbody> <tr> <td>Touchscreen</td><td>✓</td><td>✓</td></tr> <tr> <td>Webcam</td><td>✓</td><td></td></tr> <tr> <td>Microphone</td><td>✓</td><td></td></tr> <tr> <td>Fingerprint scanner</td><td>✓</td><td></td></tr> </tbody> </table>	Device	Input	Output	Touchscreen	✓	✓	Webcam	✓		Microphone	✓		Fingerprint scanner	✓		
Device	Input	Output															
Touchscreen	✓	✓															
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Microphone	✓																
Fingerprint scanner	✓																
6(a)(ii)	1 mark for any 1 correct letter in the correct position 2 marks for any 2 correct letters in the correct positions 3 marks for any 3 correct letters in the correct positions 4 marks for 5 correct letters in the correct positions C An electric current is sent to the speaker. E The electric current passes through the coil. <i>The current in the coil creates an electromagnetic field.</i> A Changes in the audio signal cause the direction of the electrical current to change. This determines the polarity of the electromagnet. D The electromagnet is repelled by, or attracted to the permanent magnet. <i>The movement of the coil causes the diaphragm to vibrate.</i> B The vibration creates sound waves.	4															
6(b)(i)	To store files / software long term	1															
6(b)(ii)	1 mark per bullet point to max 3 - No moving parts - Solid state memory is non-volatile - Makes use of blocks / arrays of ... Semiconductors // NAND gates // NOR gates // transistors // integrated circuits - SSD Controller manages the components - Uses a grid of columns and rows that has two transistors at each intersection - One transistor is called a floating gate - The second transistor is called the control gate - Memory cells store voltages which can represent either a 0 or a 1 - Essentially the movement of electrons is controlled to read/write - Not possible to overwrite existing data // it is necessary to first erase the old data then write the new data in the same location	3															



Question	Answer	
6(c)	1 mark per bullet point to max 2 • RAM stores currently running parts of files / programs / processes / OS • ROM stores boot up instructions / OS kernel // data permanently // store the firmware for the tablet	
6(d)(i)	1 mark per bullet point to max 4 Max 3 for image Max 3 for sound Images • The images are stored as bitmaps • Each image is made up of pixels • ... each pixel is of a single colour • Each colour has a unique binary number • Store the sequence of binary numbers for each image / frame // store the binary value of each pixel Sound • Measure the height/amplitude of the sound wave • A set number of times per second // at regular time intervals • Each amplitude has a unique binary number • Store the sequence of binary numbers for each sample	4
6(d)(ii)	1 mark per bullet point max 2 for each coding term. Interlaced encoding • The data from a single frame are encoded as two separate fields • One containing the data for the even numbered rows / lines and the other has the data for the odd numbered rows / lines • The image is rendered by alternating between the even field and the odd field of each successive frame • The viewer sees data from two frames simultaneously • The rate of picture display (the field rate) is twice the rate of image frame display (the frame rate) • Produces what appears to the eye to be a high refresh rate • Halves the transmission bandwidth requirements Progressive encoding • Stores the data for an entire frame • Displays all the frame data at the same time • The rate of picture display is the same as the frame rate • High bandwidth requirements	4



Question	Answer	
6(e)(i)	1 mark per bullet to max 3 • The data is compressed before transmitting • The video is transmitted continuously as a series of bits • The video is hosted on a media server • On download, the server sends the data to a buffer on the client computers // The buffer stores the data from the server • The recipient / user's software receives bit stream from the buffer	
6(e)(ii)	1 mark for: On-demand 1 mark for justification from: • The video does not need to be broadcast live // the video is already recorded • Dominic's colleagues will watch the video at a later date // at their convenience	2
6(e)(iii)	1 mark per description Temporal Redundancy • Pixels in a sequence of consecutive video frames have the same value in the same location Spatial Redundancy • A sequence of consecutive pixels in a single video frame have the same value	2

QUESTION 9.



Question	Answer	Marks
3(a)(i)	1 mark per table • CUSTOMER table has at least customer ID, customer name, address and contact details • ROOM has at least room number, room type, • BOOKING has at least booking ID, room number, customer ID, start date, number of nights CUSTOMER (<u>CustomerID</u>, Name, Address, ContactDetails) ROOM (RoomNumber, RoomType) BOOKING (BookingID, RoomNumber, CustomerID, StartDate, NumberNights)	3



Question	Answer		
3(a)(ii)	1 mark for 1 or 2 correct Primary Keys, 2 marks for 3 correct Primary Keys CUSTOMER: CustomerID ROOM: RoomNumber BOOKING: BookingID		
3(a)(iii)	1 mark for both table name and Foreign Key Table: BOOKING Foreign Key: CustomerID / RoomNumber		
3(b)	1 mark per bullet point to max 2 plus 1 mark for suitable example for each DBMS tool Developer Interface - To create user friendly features e.g. forms to enter new bookings - To create outputs e.g. report of bookings on a given date - To create interactive features e.g. buttons and menus Query processor - To create SQL/QBE queries - To search for data that meets set criteria, e.g. all bookings for next week - To perform calculations on extracted data, e.g. number of empty rooms tomorrow		
3c	1 mark for at least two correct rows, 2 marks for all four correct rows		
	Script	DDL	DML
	CREATE TABLE FILMS	✓	
	SELECT FilmID FROM FILMS		✓
	ALTER TABLE FILMS ADD PRIMARY KEY (FilmID)	✓	
	CREATE DATABASE MYDATA	✓	