GCSE

Computer Science

J277/01: Computer systems

General Certificate of Secondary Education

Mark Scheme for June 2022

OCR (Oxford Cambridge and RSA) is a leading UK awarding body, providing a wide range of qualifications to meet the needs of candidates of all ages and abilities. OCR qualifications include AS/A Levels, Diplomas, GCSEs, Cambridge Nationals, Cambridge Technicals, Functional Skills, Key Skills, Entry Level qualifications, NVQs and vocational qualifications in areas such as IT, business, languages, teaching/training, administration and secretarial skills.

It is also responsible for developing new specifications to meet national requirements and the needs of students and teachers. OCR is a not-for-profit organisation; any surplus made is invested back into the establishment to help towards the development of qualifications and support, which keep pace with the changing needs of today's society.

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

MARKING INSTRUCTIONS

PREPARATION FOR MARKING
SCORIS

1.   Make sure that you have accessed and completed the relevant training packages for on-screen marking: *scoris assessor Online Training*; *OCR Essential Guide to Marking*.

2.   Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal http://www.rm.com/support/ca

3.   Log-in to scoris and mark the **required number** of practice responses ("scripts") and the **number of required** standardisation responses.

     YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

MARKING

1.   Mark strictly to the mark scheme.

2.   Marks awarded must relate directly to the marking criteria.

3.   The schedule of dates is very important. It is essential that you meet the scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.

4.   If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the scoris messaging system, or by email.

5.   **Crossed Out Responses**
     Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

     Rubric Error Responses – Optional Questions
     Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into RM assessor, which will select the highest mark from those awarded. *(The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)*

     Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).
When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

Contradictory Responses
When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

Short Answer Questions (requiring only a list by way of a response, usually worth only **one mark per response**)
Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. *(The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)*

Short Answer Questions (requiring a more developed response, worth **two or more marks**)
If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

Longer Answer Questions (requiring a developed response)
Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. Award No Response (NR) if:
    - there is nothing written in the answer space

    Award Zero '0' if:

    - anything is written in the answer space and is not worthy of credit (this includes text and symbols).

    Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.

8.   The scoris **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.**
       If you have any questions or comments for your team leader, use the phone, the scoris messaging system, or e-mail.

9.   Assistant Examiners will send a brief report on the performance of candidates to their Team Leader (Supervisor) via email by the end of the marking period. The report should contain notes on particular strengths displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.

10.   For answers marked by levels of response: Not applicable in F501
      a.   **To determine the level** – start at the highest level and work down until you reach the level that matches the answer
      b.   **To determine the mark within the level**, consider the following:

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

11. **Annotations**

Annotation	Meaning
∧	Omission mark
BOD	Benefit of doubt
✖	Cross
FT	Follow through
NAQ	Not answered question
NBOD	Benefit of doubt not given
REP	Repeat
✔	Tick
TV	Too vague
SEEN	Noted but credit not given, blank pages, pages with no annotation

Question			Answer	Mark	Guidance
1	(a)		1 mark for each row Table below	4	
1	(b)		1 mark for working e.g. dividing by 2, or writing the powers/values with the binary below, subtracting. 1 mark for answer 11011101	2	No FT for answer from working. Award the working mark if the binary is back-to-front i.e. 1 2 4 8 16 32 64 128 1 0 1 1 1 0 1 1
1	(c)		1 mark for working e.g. multiplying by 16 (2 * 16 + 15), or converting to binary first (0010 1111) 1 mark for answer 47	2	No FT for answers from working.
1	(d)		1 mark for B0	1	Correct answer only
1	(e)		16	1	Correct answer only
1	(f)		00010001	1	

Question 1(a) table:

File size	2 megabytes	2 petabytes	2 kilobytes	2 bytes	2 gigabytes
2000 bytes			✓		
2000 terabytes		✓			
16 bits				✓	
4 nibbles				✓	

Question			Answer	Mark	Guidance
2			1 mark for each term or definition	4	Read whole answer for CU and award correct point at any stage. CU 'sends signals to components' is not enough, it isn't saying what the signal's purpose is

CPU component or register	Definition
Program Counter // PC	Stores the address of the next instruction to be fetched from memory. Increments in each fetch-execute cycle.
CU (Control Unit)	(Sends signals to) **synchronise** / **control** / **coordinates** the processor/hardware/F-E cycle/processes/**flow** of data // **decodes** instructions (in CIR) // **runs** F-E cycle
Memory Address Register // MAR	Stores the address of the data to be fetched from, or the address where the data is to be stored.
Arithmetic Logic Unit // ALU	Performs the mathematical and logical calculations.

Question			Answer	Mark	Guidance
3	**(a)**	**(i)**	1 mark each to max 3 - Slower transmission of data // less data can be transmitted **at the same time** // the transmission rate decreases // time to send/receive increases (More devices mean) more data is being transmitted (at a time) **Bandwidth** will be split between all the devices (sending data) // each device uses some of the bandwidth …this means that there is less **bandwidth for each device** - Devices have to wait **longer** before they can transmit // **increased** latency - If the maximum bandwidth is used then devices cannot transmit - Central device/switch/router has to handle more requests and may run slower **More** collisions (likely) // **higher** error rate … …more data has to be retransmitted - Loss of **more** packets … …more data has to be retransmitted	3	The question is why. More devices do not decrease the bandwidth of the network. They decrease the amount allocated/available to each device. Do not accept higher contention ratio. This term means the number of users on a connection, and is therefore repeating the question.
3	**(a)**	**(ii)**	1 mark e.g. - Bandwidth - Interference // by example - Wired // wireless // transmission medium - Type/amount of data being transmitted - Central hardware performance // by example e.g. router/switch - Error rate - Distance between nodes - Topology // physical layout - Wireless repeaters	1	Do not award the number of users. Question is performance of network as a whole, not an individual device.

3	(b)		1 mark for each completed term A website is hosted on a **web server**. The computers that access the websites are called **clients**. The user enters a **Uniform Resource Locator** into a web browser. The web browser sends a request to the **Domain Name Server** for the matching IP (Internet Protocol) address. If found the IP address is returned. A request is then sent to the IP address for the website. An IPv4 address is made of 4 groups of digits. Each group can be between **0** and **255**. The groups of digits are separated by a **full stop**	7	Words are given so must match, however accept domain name system for domain name server, URL, DNS. Accept 0 and 255 in either order Do not allow server for web server because file server is another option and it will be ambiguous.
3	(c)		1 mark each to max 2 • Ethernet is used by (mostly) all manufacturers // Ethernet is used in many devices • To allow **compatibility** with other devices • Ethernet has a high bandwidth • Ethernet has inbuilt security • Ethernet is a proven/reliable connection • Ethernet is low cost for **purchase**/**installation**/**maintenance** (compared to other wired connections)	2	Accept description of a standard, and/or benefits of Ethernet (i.e. why has this become a standard).
3	(d)		1 mark each to max 3 e.g. • Receive packets • Forward/sending/transmitting packets • Maintain a routing table // by description • Identify the most efficient path to the destination / correct IP / correct location • Assign IP addresses to nodes/devices • Converts packets from one protocol to another.	3	Question is tasks carried out by a router, not the use of a router in a network.

3	(e)		1 mark each to max 2 e.g. - Data cannot be **understood** if intercepted // The data will be meaningless - So that only authorised users can access the **confidential** material // protect **confidential**/**personal**/**user**/**library** data - To follow legislation/DPA	2	Question is transmission not storage Candidates might answer in terms of why encryption is good, or why the current system is not good. If the candidate has not clearly said which they are talking about (e.g. the current system ….. or encryption means ….) then the reverse of each mark point can be given.
3	(f)		1 mark each e.g. Send email: **SMTP** // simple mail transfer protocol Access website securely: **HTTPS** // hypertext transfer protocol secure	2	Mark first answer in each line. If abbreviation is inaccurate, check if written out (and vice-versa).
4			**Mark Band 3–High Level** **(6-8 marks)** The candidate demonstrates a thorough knowledge and understanding of a wide range of considerations in relation to the question; the material is generally accurate and detailed. The candidate is able to apply their knowledge and understanding directly and consistently to the context provided. Evidence/examples will be explicitly relevant to the explanation. The candidate is able to weigh up both sides of the discussion and includes reference to the impact on all areas showing thorough recognition of influencing factors. *There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.* **Mark Band 2-Mid Level** **(3-5 marks)** The candidate demonstrates reasonable knowledge and understanding of a range of considerations in	8 AO2 1a (4) AO2 1b (4)	The following is indicative of possible factors/evidence that candidates may refer to but is not prescriptive or exhaustive: **Indicative Content:** Legal issues: - Copyright designs and patents act - can check for plagiarism automatically and highlight posts e.g. videos or images - Data protection act - needs to make sure rules are followed so that the AI algorithm does not breach e.g. security - Check that materials are all legal - User has agreed the terms when signing up so should expect it Ethical issues: - Users may not want everything they post monitoring - May incorrectly block users/posts

			relation to the question; the material is generally accurate but at times underdeveloped. The candidate is able to apply their knowledge and understanding directly to the context provided although one or two opportunities are missed. Evidence/examples are for the most part implicitly relevant to the explanation. The candidate makes a reasonable attempt to discuss the impact on most areas, showing reasonable recognition of influencing factors. *There is a line of reasoning presented with some structure. The information presented is in the most part relevant and supported by some evidence.* **Mark Band 1-Low Level** **(1-2 marks)** The candidate demonstrates a basic knowledge of considerations with limited understanding shown; the material is basic and contains some inaccuracies. The candidate makes a limited attempt to apply acquired knowledge and understanding to the context provided. The candidate provides nothing more than an unsupported assertion. *The information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.* **0 marks** No attempt to answer the question or response is not worthy of credit		• Can limit plagiarism • Can make sure inappropriate/illegal posts are not published • Website will need to tell users what it is doing and they must agree with it • Record of monitoring reports may be stored and used for other means • Users may feel safer using the website because they know inappropriate material will not be published Privacy issues: • Users may feel like they are being watched all the time • Terms and conditions may sign away their rights to privacy when using the website • People may prefer a computer analysing their posts than people reading them

Question			Answer	Mark	Guidance
5	**(a)**		1 mark each to max 2 e.g. • Locks • Keycard entry • Biometric **entry to room** • Passcode **entry to room** • Alarms • Security guards/team • CCTV	2	Secure room/device is TV Mark first in each answer space Do not award password, but do award passcodes/word on doors.

5	**(b)**		1 mark for each name, 1 per bullet for matching to description to max 2 each.
			e.g.
			• Anti-malware
			   o Scans for / identifies virus/spyware/malware
			   o Compares data to a database of malware
			   o Alerts user and requests action such as ..
			   o Quarantines/deletes virus/spyware/malware
			   o Stops the download of virus/spyware/malware
			
			• Firewall
			   o Scans incoming and outgoing traffic
			   o Compares traffic to a criteria
			   o Blocks traffic that is unauthorised
			   o Blocks incoming/outgoing traffic
			
			• Encryption
			   o Scrambles data
			   o …using an algorithm
			   o So if intercepted it cannot be **understood**
			   o Key needed to decrypt
			
			• User access levels
			   o Data can be read/write/ read-write // by example
			   o Prevents accidental changes
			   o Limits data users can access
			
			• Anti-virus
				6	Mark method first. If method is wrong, do not read on. If method is unclear, or part of a description of a method, read full answer.
					
					If second method is a repeat of the first (for example password and then locking out) mark whole answer for max 3.

- o Scans for / identifies virus/malware
- o Compares data to a database of viruses/malware
- o Alerts user and requests action such as ..
- o **Quarantines**/**deletes** virus/spyware
- o Stops the **download** of virus/malware

- Anti-spyware
  - o Scans for / identifies spyware / keylogger
  - o Compares data to a database of spyware
  - o Alerts user and requests action such as ..
  - o Quarantines/deletes spyware
  - o Stops the download of spyware/malware

- Passwords/biometrics/authentication
  - o code/fingerprint etc. has to be **correctly** entered to gain access
  - o strong password // letters, numbers, symbols // fingerprint is unique to individual …
  - o harder/impossible for a brute-force attack to succeed
  - o lock after set number of failed attempts

- Two-step authentication
  - o a code is sent to user's separate device
  - o unauthorised person will need access to this device as well

5	(c)		1 mark for each row	5	

1 mark for each row

Event	The Data Protection Act (2018)	Computer Misuse Act (1990)	Copyright Designs and Patents Act (1988)
A company transmits personal data to another company without the individual's permission	✓		
A school publishes their student's addresses on the school website.	✓		
The interface for a piece of software is replicated by a rival company			✓
A user leaves a computer logged on and another person leaves them a message on their desktop		✓	
A student guesses their teacher's password and accessing computer account		✓	

6	(a)	(i)	1 mark per bullet to max 3 • (analogue) sound wave is sampled • … amplitude/height (of wave) is measured • … at set/regular time intervals // by example • Each sample/measurement is stored as a binary number • The binary number for each sample is stored sequentially	3	MP2 do not award frequency of the wave is measured

| 6 | (a) | (ii) | 1 mark for each row | | | | | 3 | |

Change	File size increases	File size decreases	Accuracy increases	Accuracy decreases
Duration changes from 10 minutes to 20 minutes	✓			
Sample rate changes from 44 kilohertz to 8 kilohertz		✓		✓
Bit depth changes from 8 bits to 16 bits	✓		✓	

6	(b)	(i)	T	1	Case sensitive Mark first letter
6	(b)	(ii)	Unicode	1	Accept any other valid
6	(c)		1 mark each to max 3 e.g. • Height • Width • Colour/bit depth • Date • Geolocation • File size • File type • Compression type • Author	3	Accept anything reasonable but not features of image e.g. names of people Award resolution for height or width, but max 2 for resolution/dimensions/image size, height, width. 'Colour' on its own is NE. 'Size' on its own is NE. Needs to be what is stored, e.g. date is stored, age of image is not stored.

6	(d)	(i)	1 mark each to max 2 • Reduces file **size** • Takes less time to transmit // faster to upload // faster to download • Requires less **storage** space (on the server/device) • May otherwise exceed **email** storage • Uses less bandwidth to transmit • Uses less data to send (e.g. mobile data)	2	Mark first answer in each section
6	(d)	(ii)	1 mark each to max 2 • Data will be **permanently** lost // not all data is recoverable • **Text files** cannot be compressed with lossy • Teacher requires the original/high quality **image/video/sound** files	2	MP2 is for identifying that the files contain text and they cannot be compressed with lossy

Question			Answer	Mark	Guidance
7	**(a)**	**(i)**	1 mark for • ROM is non-volatile, RAM is volatile // by description • Content of ROM cannot (usually) be changed, content of RAM can be changed	1	Read whole answer
7	**(a)**	**(ii)**	1 mark each to max 2 e.g. • Web browser/application that is **running** • (Parts of the) operating system currently **running** • Current video/film/tv program being watched • Data being downloaded/buffered • Button pressed by the user • Current volume • Current channel being watched • Source being watched (e.g. HDMI1)	2	Allow anything reasonable but must be clearly RAM e.g. not just stores the software/OS (this is secondary storage). Do not award brand names without exemplification.
7	**(b)**	**(i)**	1 mark for example e.g. the OS, web browser software, recorded show, user preferences 1 mark for • To store data once the computer is turned off / permanently // for non-volatile storage	2	Allow 2 marks by example, e.g. "To install software that will not be lost when the TV is turned off" gets 1 mark for software and 1 mark for not being lost when turned off. Do not award brand names without exemplification.

| 7 | (b) | (ii) | 1 mark for choice either magnetic or solid state

1 mark per bullet to max 3 for justification e.g.
Magnetic:
• Large storage capacity
• … for storing software/videos/HD
• Television unlikely to be moved
• … therefore durability/portability not required
• Cost to **purchase** is low
• … so the TV will be cheaper to **manufacture**/**purchase**
• Device will fit in a tv // device is small
• Longevity // reliable

Solid state:
• Large storage capacity
• … for storing software/videos/HD
• Television may be moved
• …therefore durable/robust/portable
• Fast **data access**
• … television will be more responsive
• Cost to **purchase** is low
• …so the TV is not too expensive to **manufacture**/**purchase**
• Run quieter
• Produce less heat
• Use less energy
• Compact // lightweight
• …so tv can be made smaller / lighter | 4 | Do not award specific device, e.g. hard disk. Question asks for type. But then FT for justification to max 3. If device and type given award, e.g. solid state drive, SSD, magnetic hard disk drive.

Mark first secondary storage type given.

No secondary storage type, read justification for a type. Do not award this but mark justification (Max 3).

Justification must match choice.

If type is inappropriate e.g. optical, do not award. |

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on

01223 553998

Alternatively, you can email us on

support@ocr.org.uk

For more information visit

ocr.org.uk/qualifications/resource-finder

ocr.org.uk

Twitter/ocrexams

/ocrexams

/company/ocr

/ocrexams