OCR 2024 Predicted Paper 1
GCSE (9–1) Computer Science
J277/01 Computer Systems
Time allowed: 1 hour 30 minutes

Do not use a calculator

INSTRUCTIONS

- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space, use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer all the questions.

INFORMATION

- The total mark for this paper is **80**.
- The marks for each question are shown in brackets [].
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has 13 pages.

ADVICE

- Read each question carefully before you start your answer.
- This is just a predicted paper based off previous years

1. Ben has designed a computer using Von Neumann architecture.

(a) Describe the purpose of **two** registers that are used by Von Neumann architecture.

1 MAR - Memory Address Register
Stores the address of the data to be fetched from, or the address where the data is to be stored

2 MDR - Memory Data Register
Stores the data itself which has been read from main memory or is about to be written to main memory

~~OR:~~
Program Counter - Stores the address of the next instruction to be fetched from memory. (Which sends the value to the MAR) This counter increments by 1 in each FDE cycle
Accumulator- Stores the results of calculations

[4]

(b) State what is meant by a single core 3.5 GHz processor.

Single core means there is only one processor
3.5Ghz means it can run 3.5 billion FDE cycles per second

[2]

2. Computers represent data in binary form.

(a) Complete the table by writing the missing denary, 8-bit binary or hexadecimal values.

Denary	8-bit binary	Hexadecimal
18	00010010	12
40	00101000	28
118	01110110	76
248	11111000	F8

[4]

(b) Identify how many unique values can be represented by 5 bits.

2^5 = 32

[1]

(c) Perform a binary shift of 3 places right on the binary number 10001110.

00010001

[1]

(d) Tick **one** box to identify the largest file size.

- [ ] 2 000 000 bytes
- [ ] 2300KB
- [x] 200MB
- [ ] 0.1GB

[1]

(e) Add the following 8-bit binary numbers

	1	0	0	1	1	0	1	1
+	0	1	1	1	0	1	0	0
(1)	0	0	0	0	1	1	1	1

[2]

(f) An overflow error can occur when adding two 8-bit binary numbers.
Describe what is meant by an overflow error.

- There is an extra carry/bit
- As the numbers cannot fit into 8 bits
- Result is greater than 255/11111111

[2]

3. A student is performing a range of actions on the internet using their computer.

(a) Complete the table by identifying the most appropriate protocol for each of the tasks the student is performing.

Task	Protocol
Downloading an email to your computer	IMAP // POP
Downloading a text document from a web server	FTP // HTTP // HTTPS
Transmitting a file from a client to a server	FTP
Requesting to view a news webpage from a web server	HTTP // HTTPS

[4]

(b) Some protocols have layers.
Describe one advantage of using layers to construct network protocols.

- Each layer is independent // layers are not reliant on other layers
•One layer can be changed without affecting the others // a layer can function without needing/changing/impacting any other layer // self-contained
- Separates tasks so they can be developed independently
• A developer can focus on only one layer // developer can specialise
• Allows for standards for individual tasks/layers to be developed // for compatibility
• Manufacturers can develop hardware to fit into one particular layer
• To group together similar protocols

[2]

4. A company, GCST Supermarkets, has supermarket stores throughout the country. The computers for each store connect to the central office using a Wide Area Network (WAN).

(a) One characteristic of a WAN is that they are set up over a large geographical area. Give one other characteristic of a WAN.

WAN uses external hardware/infrastructure/cables/network

[1]

(b) GCST Supermarkets use a client server network to connect the checkout computers to the store's server.
Describe one benefit to GCST Supermarkets of using a client server network instead of a peer-to-peer network.

All files can be stored centrally
- so workers can access files from any computer
-all computers can update the central database/file
-Peer-to-peer files might be stored on their own computers

OR:
Backups are central
-all data is backed up each time
-individual computers do not need to backup their own data
--peer to peer may need to perform their own backups

[2]

(c) The supermarket manager's computer can access the Internet and the World Wide Web.
Explain the difference between the Internet and the World Wide Web.

-WWW is the web pages (that are stored on servers)
- Internet is the infrastructure // collection of networks

[2]

(d) The supermarket introduces a WAP (Wireless Access Point) to allow network access to wireless devices. The manager has noticed that the performance of the network has recently decreased.
Describe how introducing wireless access could have slowed down the network.

- Wireless transmission is slower than cabled
- More devices/users could be connected eg mobile phones // increase in traffic
- ...reducing bandwidth available for each user
- Wireless can be limited by interference
-.... such as walls that disrupt the signal

[2]

(e) The IP address 192.134.243.433 is linked to the website with a URL of https://www.gcsecomputersciencetutor.vercel.app. When the URL is entered into a browser, the website homepage is loaded.
Describe the relationship between the website URL, the IP address and the webserver.

The website is hosted on a webserver
The website/webserver has an IP address
(browser) Sends uRL to DNS
URL has a linked IP
DNS Finds IP
if DNS cannot find the IP it passes request to higher DNS if not found return error
IP address sent back to the browser

[5]

5. Alex is producing images and sound effects for a website.
Part of a bitmap image is shown in Fig. 2:

W	W	R	R	R	B	B
W	W	R	Y	R	B	B
B	B	R	R	R	B	B
B	B	B	LG	B	DG	B
B	DG	DG	LG	DG	B	B
B	B	DG	LG	B	B	B
B	B	B	LG	B	B	B

Fig. 2

The letters represent a colour, as shown in Fig. 3:

Letter	**Colour**
W	White
B	Blue
R	Red
Y	Yellow
DG	Dark Green
LG	Light Green

Fig. 3

(a) Using the example in Fig. 2, explain how a bitmap image is stored on a computer.

An image is made up of pixels.
A pixel can be one colour
Each colour has a unique/corresponding binary number
Each pixel is given the binary number of its colour.
The binary numbers are stored in order in the file
eg, white = 000, red = 010, blue = 110, top line would be 000000010010010110110

[3]

(b) State what is meant by colour depth and give the colour depth required to store the image in Fig. 2.

Colour depth is the number of bits used per pixel. Colour depth of 3 is required as there are 6 different colours, and colour depth 3 means that there are 8 unique values available

[2]

(c) Explain how reducing the number of colours in an image can reduce its file size.

1 Fewer bits are needed per colour which means fewer bits per pixel

2 If we limit it to 4 colours, we would only need a 2 bits

[2]

(d) Alex needs to create an audio recording of himself singing.

(i) Explain how sampling is used to make the recording.

- The amplitude/height of the wave is measured
- At set intervals, for example every second
- And stored as a binary number
- The samples form an approximated sound wave

[3]

(ii) State the effects of increasing the sample rate of the recording.

File size increases
So the sound is better quality

[2]

6. Binary numbers can represent different forms of data.

(a) One form of data is characters.
Complete the description of how computers represent characters in binary using the given list of terms. Not all terms will be used.

2	4	8	9	16	32	256	71	72	74	76
78	80	81	all	different		identical		one	repeated	
similar	some		unique							

A character set stores ..... all ..... of the characters that the computer can represent. Each character is given a ..... unique/different ..... binary code. Lower-case and upper-case letters in a character set are given ..... unique/different/similar ..... binary codes. One example of a character set is ASCII. This character set uses ..... 8 ..... bits for each character. If the code value for the character 'F' is 70 then the code value for the character 'L' is ..... 76 .....

[5]

(b) Tick one or more boxes in each row to identify whether each statement applies to each character set.

	ASCII	Extended ASCII	Unicode
Can represent European characters		✓	✓
Uses different character codes for upper-case and lower-case letters	✓	✓	✓
Can represent thousands of different characters, including Russian and Chinese symbols			✓

[3]

7. Hamish stores confidential documents on his laptop.

(a) Hamish would like to use encryption to add another layer of protection to his documents.
Explain how encryption helps to protect Hamish's documents.

Uses an algorithm to ... jump/scramble the data so that if it is accessed it cannot be understood. By using keys to encrypt/decrypt the data

[2]

(b) Identify and describe one other software-based security method that will help Hamish protect his computer system and data.

Method Firewall

Description Monitor incoming and outgoing transmissions/packets // stops unauthorised traffic

[3]

(c) Hamish's laptop has both hardware and software. The hardware includes primary and secondary storage.
Explain why a computer needs both primary and secondary storage.

Primary
• to store (active) data/instructions/software/OS that the processor needs to access
// without primary the computer won't be able to start up/work
// (ROM) so the start-up instructions are not deleted when the computer turns off
// (RAM) to store the currently running data/software/instructions
// (Cache) to store frequently used data/instructions

Secondary
• to store data/files long-term/permanently
// without secondary the user's files will not be stored when the power is turned off
// store data not currently being used

[2]

8. Security on a computer can be provided directly by the operating system or by using utility programs.

(a) State two utilities that can be used for security.

1 Anti Virus

2 Firewall

Or:
Passwords//Authentication/encryption/user access levels

[2]

(b) Explain why memory management is necessary.

memory management is used to control the use of the RAM and to share processor time between different programs and processes. Allows programs larger than main memory to run

[3]

(c) The computer has Virtual Memory (VM)
The table has four statements about VM. Not all of the statements are correct.
Tick the **True** column for the statements that are correct.
Rewrite any statement that is incorrect in the **False** column by changing the statement to make it true.

Statement	**True**	**False – rewrite the statement to make it true.**
A section of primary storage is partitioned to act as virtual memory		A section of SECONDARY storage....
VM is needed when RAM is full, or nearly full	✓	
Data from VM is transferred back to secondary storage when needed		.....transferred back to RAM when needed
Data from ROM is transferred into VM		Data from RAM is transferred into VM

[4]

9. Layla is a software engineer. She is creating a new version of a computer game she released three years ago. She is considering selling the game online and not making it available physically in shops.

(a) Describe the environmental impact of Layla's decision.

less plastic/paper used to manufacture
Less electrical power needed
No petrol used to distribute ... smaller carbon footprint

[2]

(b) Layla released her game under a proprietary licence.
Explain why a proprietary licence is a more appropriate choice than open source.

She can sell it for a fee
Protects her source code so it can't be copied

[2]

(c) Tick one box on each row to identify the legislation that would cover each of the given events.

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 accidentally publishes their students' 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 accesses their computer account.		✓	

[5]

END OF QUESTION PAPER