S4 Information and Communication Technology Practice Paper: Data Representation and Binary, Computer Systems and Storage, Networks and the Internet, Databases and Spreadsheets, Programming and Algorithms, Information Literacy and Security

S4 | Information and Communication Technology | Time: 75 minutes | Total: 100 marks | 24 questions

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Part A - Data Representation and Binary (20 marks)

Show your working. State the number of bits in every binary answer.

1. Convert the binary number 10110110 to denary. [5]

2. Convert the denary number 202 to an 8-bit binary number. [5]

3. An uncompressed 24-bit colour image is 1024 x 768 pixels. Find its file size in MiB, where 1 MiB = 1024 x 1024 bytes. [5]

4. Find the denary value of the hexadecimal number 3F and convert denary 201 to hexadecimal. [5]

Part B - Computer Systems and Storage (18 marks)

Show steps in calculations; in comparison questions state two differences.

5. A hard disk is labelled 2 TB, where the maker uses 1 TB = 10^12 bytes and the operating system uses 1 TiB = 1024^4 bytes. Find the capacity shown by the system in TiB, correct to 2 decimal places. [5]

6. Compare SSD and HDD in terms of access speed and resistance to shock. [5]

7. A program needs 8 GB of memory but the computer has only 6 GB of physical RAM. If the operating system uses virtual memory, find the paging space needed on disk in GB. [4]

8. A processor runs at 3.2 GHz and needs 4 clock cycles per instruction on average. Find the number of instructions executed per second in millions. [4]

Part C - Networks and the Internet (16 marks)

Use 1 byte = 8 bits and 1 Mb = 10^6 bits.

9. A 480 MB file is downloaded over a 100 Mbps connection. Find the time needed in seconds. [4]

10. An IPv4 network uses a /24 prefix length. Find the number of host addresses available in that subnet. [4]

11. Match each protocol to its use: HTTP, HTTPS, SMTP, FTP. [4]

12. Compare 2.4 GHz and 5 GHz wireless networks in terms of coverage and interference. [4]

Part D - Databases and Spreadsheets (16 marks)

Spreadsheet questions use A1 style cell references.

13. Cells B2 to B6 hold 68, 72, 55, 80 and 90. Find the results of =SUM(B2:B6) and =AVERAGE(B2:B6). [4]

14. Explain the purpose of a primary key in a database and give one example. [4]

15. A student table has 200 records: 120 students take ICT and 45 students take ICT with a mathematics score of 80 or above. A query requires ICT AND mathematics >= 80. Find the number of matching records. [4]

16. State the difference between sorting and filtering in a spreadsheet. [4]

Part E - Programming and Algorithms (15 marks)

Pseudo-code or formulas are both acceptable; show your steps.

17. Write an algorithm that finds the sum of the integers from 1 to 50 and state the result. [4]

18. A binary search looks for a target in 1,000 sorted items. Find the maximum number of comparisons needed. [4]

19. Bubble sort is applied to 5 items. Find the number of comparisons in the worst case. [4]

20. What is the value of x after this pseudo-code? x <- 3; repeat 4 times: x <- x * 2. [3]

Part F - Information Literacy and Security (15 marks)

In explanation questions give a concrete measure or reason.

21. How many different 4-digit PIN codes are possible? [4]

22. An 8-character password uses upper case letters, lower case letters and digits, giving 62 possible characters. Find the number of combinations in scientific notation to 3 significant figures. [4]

23. Explain how a phishing email works and suggest one preventive measure. [4]

24. Describe the 3-2-1 backup rule. [3]
