S3 ICT Practice Paper (Set 2): number systems, logic gates, networks, spreadsheets, databases and algorithms

S3 Information and Communication Technology | Time: 60 minutes | Total: 100 marks | 22 questions

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Section A: Number systems and data representation (16 marks)

Use the information above to answer Section A.

1. (a) Convert the binary number 1011 0110 into decimal and into hexadecimal, showing your working.

2. (b) Convert the decimal number 245 into an 8-bit binary number and give its hexadecimal value.

3. (c) Calculate the size of File 1 (12 seconds, stereo, 44 100 Hz, 16 bits) in MB, taking 1 MB as 1 048 576 bytes, and explain why a music file is usually smaller than this value.

4. (d) Give the ASCII decimal values and the 8-bit binary codes of the three letters in File 2.

Section B: Logic gates (16 marks)

Use the alarm system above to answer Section B.

5. (a) Complete the truth table: give the value of B for (D, W, O) equal to (0,0,0), (1,0,0), (0,1,1) and (1,1,0).

6. (b) Explain why the buzzer stays silent when the caretaker turns on the override key even if both door and window sensors detect movement.

7. (c) Draw, or describe in words, a gate circuit that produces B, and state the number and type of logic gates used.

8. (d) If the circuit were changed to B = (D AND W) OR (NOT O), what would the buzzer do when the override key is on, and what is the problem with that design?

Section C: Networks, bandwidth and security (16 marks)

Use the school network above to answer Section C.

9. (a) Name the type of network formed by the 30 computers, the printer and the file server, give one reason, and give one example of a wide area network (WAN).

10. (b) How many seconds are needed at least to download the 480 MB video over the 40 Mbps link? Show your working.

11. (c) Which service normally assigns IP addresses to the school computers? Give one private IP address range and explain why private addresses are used inside the school.

12. (d) When a student types a password into Internet banking, which protocol should the web address start with? Explain how it differs in security from the unencrypted protocol.

Section D: Spreadsheet modelling (16 marks)

Use the spreadsheet above to answer Section D.

13. (a) The formula in E2 is copied to E5. Write the formula in E5 and explain the difference between C1 and B2 in the copied formula.

14. (b) If the value in B3 is 58, what will E3 display? Show your reasoning.

15. (c) Write the formulas that calculate the class average mark and the number of students who borrowed 4 books or more.

16. (d) To compare the number of students in the mark bands 0-59, 60-69, 70-79 and 80 or above, which chart should the teacher use? Give one reason.

Section E: Databases and algorithms (16 marks)

Use the table and pseudocode above to answer Section E.

17. (a) Name three fields of this table and state which field is the best primary key, with a reason.

18. (b) Write a query condition that finds 3A students who borrowed 4 books or more, and state how many records match.

19. (c) Trace the pseudocode and give the value of total after each loop and the final output.

20. (d) To sum the squares of 1 to 5 instead, which line must change, what should it become, and what is the new output?

Section F: Integrated data analysis and security advice (20 marks)

Use the e-library log above to answer Section F.

21. (a) Work out the weekly totals of logins and books borrowed, the average books borrowed per day to one decimal place, and the busiest day. Then compare with storage: if 4 500 MB of e-books uses 90 percent of the capacity, what is the total capacity in MB and how much free space is left?

22. (b) Overdue items rise from 9 on Monday to 14 on Friday. Suggest two concrete improvements, one about reminders and one about fines or loan periods, each with a reason, and suggest one way to protect students personal data in the library system.

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