S5 ICT Practice Paper (Paper 2)

S5 | Information and Communication Technology | Time: 75 minutes | Total: 100 marks | 24 questions

---

Part A Networking and Data Transmission

Show all steps and units.

1. (5 marks) A 30 MB file is sent over a 24 Mbps leased line. Ignoring protocol overhead, find the minimum transmission time in seconds.

Answer: 30 × 8 = 240 Mbit; 240 ÷ 24 = 10 s.

2. (4 marks) An uncompressed 24-bit bitmap of 1920 × 1080: find its size in MiB (1 MiB = 2^20 bytes).

Answer: 1920 × 1080 × 3 = 6,220,800 bytes; ÷ 1,048,576 = 5.93 MiB.

3. (4 marks) How many usable host addresses does 192.168.10.0/26 provide?

Answer: Host bits = 32 − 26 = 6, so 2^6 = 64 addresses; minus network and broadcast = 62 usable.

4. (4 marks) A 100 Mbps link runs at 80% efficiency. How long does a 50 MB file take?

Answer: Effective bandwidth 100 × 0.8 = 80 Mbps; 50 × 8 = 400 Mbit; 400 ÷ 80 = 5 s.

Part B Relational Databases and SQL

Write only the keyword or value required.

5. (4 marks) The student table has 5 rows and the enrolment table 12 rows; every student takes at least one course. How many rows does an equi-join on student ID return?

Answer: 12 rows — a one-to-many join returns one row per enrolment record.

6. (4 marks) SELECT AVG(score) FROM result WHERE class = '5A'; class 5A scores are 60, 72, 84, 90. Give the result.

Answer: (60 + 72 + 84 + 90) ÷ 4 = 306 ÷ 4 = 76.5.

7. (4 marks) An unnormalised table holds 8 students, each with 3 phone numbers. After conversion to 1NF, how many rows are there?

Answer: 8 × 3 = 24 rows, one per phone number, with a composite key (student ID, phone).

8. (4 marks) SELECT score FROM result ORDER BY score DESC LIMIT 2; scores are 60, 72, 84, 90. Give the two output rows.

Answer: 90 and 84 — descending order, first two rows.

Part C Spreadsheet Functions

Formulas start at row 2; state the resulting value.

9. (4 marks) B2 holds 78. What does =IF(B2>=80,"A",IF(B2>=65,"B","C")) return?

Answer: 78 is not ≥ 80 but is ≥ 65, so it returns "B".

10. (4 marks) C2:C6 = 5A, 5A, 5B, 5B, 5B and D2:D6 = 40, 35, 50, 20, 45. Give =SUMIF(C2:C6,"5A",D2:D6).

Answer: Only the two 5A rows: 40 + 35 = 75.

11. (4 marks) E2:E10 = 58, 61, 72, 45, 88, 90, 60, 59, 77. Give =COUNTIF(E2:E10,">=60").

Answer: Scores of 60 or above: 61, 72, 88, 90, 60, 77 — 6 in total.

12. (4 marks) B2 = 50 and F1 = 1.2. Give the value of =B2*F1, and state which cell is still referenced after the formula is copied to row 3.

Answer: 50 × 1.2 = 60; F1 is absolute, so it still refers to F1 after copying.

Part D Algorithms and Program Tracing

Give the final value or trace result.

13. (5 marks) s ← 0; for k = 1 to 19 step 2: s ← s + k. What is s at the end?

Answer: 1 + 3 + … + 19 has 10 terms, sum = 100.

14. (4 marks) Linear search for 9 in [12, 7, 25, 9, 31] — how many comparisons are needed?

Answer: 9 is the 4th element, so 4 comparisons.

15. (4 marks) Bubble sort [5, 3, 8, 1]. Give the array after the first pass and the number of swaps.

Answer: After pass 1: [3, 5, 1, 8] with 2 swaps (5↔3, 8↔1).

16. (4 marks) Binary search over 16 sorted items — how many comparisons in the worst case?

Answer: Halving 16→8→4→2→1 gives 4 splits plus one confirmation: 5 comparisons worst case.

Part E Multimedia and Compression

Include units; 1 MiB = 2^20 bytes.

17. (4 marks) A 60-second stereo recording at 44.1 kHz, 16-bit: give the uncompressed size in bytes and MiB.

Answer: 44,100 × 2 × 2 × 60 = 10,584,000 bytes ≈ 10.09 MiB.

18. (4 marks) A signal has a maximum frequency of 8 kHz. What is the minimum sampling rate under the sampling theorem?

Answer: It must be at least 2 × 8,000 = 16,000 Hz (16 kHz).

19. (4 marks) The 6,220,800-byte bitmap is compressed to 933,120 bytes. Find the compression ratio (original ÷ compressed).

Answer: 6,220,800 ÷ 933,120 ≈ 6.67, i.e. about 6.67 : 1.

20. (4 marks) With a colour depth of 8 bits, how many colours can be represented?

Answer: 2^8 = 256 colours.

Part F Information Security

Show working for numeric parts; name the mechanism for scenario parts.

21. (5 marks) A password has 8 characters from a 62-symbol set. Find its entropy in bits (1 d.p.).

Answer: 8 × log2(62) = 8 × 5.954 = 47.6 bits.

22. (4 marks) Ten users communicate pairwise with symmetric encryption. How many distinct shared keys exist in total?

Answer: C(10, 2) = 10 × 9 ÷ 2 = 45 keys.

23. (4 marks) A user types a password into a phishing site, yet the bank still asks for a one-time code. Why does the one-time code limit the damage?

Answer: The one-time code is bound to that session or transaction, so a stolen password alone cannot authenticate; reuse risk is also cut.

24. (5 marks) Give the digest length of SHA-256 and MD5 in bits and bytes.

Answer: SHA-256: 256 bits = 32 bytes; MD5: 128 bits = 16 bytes.
