S2 ICT Practice Paper: Algorithms and Flowcharts, Programming and Tracing, Web Page Structure and Hyperlinks, Database Records and Fields, Video File Size Calculations, Digital Literacy and Network Use (100 marks)

S2 | Information and Communication Technology | Time: 75 minutes | Total: 100 marks | 24 questions

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Section A Algorithms and Flowcharts

Part A: 4 marks each, 16 marks in total.

1. What is an algorithm? State three essential features of an algorithm. [4]

Answer: An algorithm is a finite sequence of steps that solves a problem; its features are clear inputs and outputs, unambiguous steps, and a finite number of steps that always terminate.

2. In a flowchart, what do a parallelogram, a diamond and a rectangle represent? [4]

Answer: A parallelogram represents input or output; a diamond represents a decision (condition); a rectangle represents a process (calculation or assignment).

3. Write the decision steps of a flowchart for "display pass if the mark is 60 or above, otherwise display fail". [4]

Answer: Read the mark, then use a diamond to test whether the mark is greater than or equal to 60; if yes output pass, otherwise output fail, and both branches merge at the end.

4. Why can one problem have more than one correct algorithm? Give one example. [4]

Answer: Any algorithm that reaches the correct result in a finite number of steps is valid, even if the wording or efficiency differs; for example, adding 1 to 10 can be done by repeated addition or by the formula (first + last) x count / 2.

Section B Programming and Tracing

Part B: 4 marks each, 16 marks in total.

5. What is the difference between a variable and a constant? Give one everyday example of each. [4]

Answer: A variable holds a value that may change while the program runs, such as a score counter; a constant is fixed once set, such as pi 3.14 or 60 minutes in an hour.

6. A program sets total to 0, then adds every integer from 1 to 10 into total. Find the value of total after the loop. [4]

Answer: total equals 1+2+...+10 = 55.

7. A program sets total to 0, then for each integer from 1 to 5 adds its square into total. Find the value of total after the loop. [4]

Answer: total equals 1+4+9+16+25 = 55.

8. In a program, what are the quotient and remainder when 47 is divided by 7? Explain the difference between integer division and the remainder operation. [4]

Answer: Quotient = 6 and remainder = 5; integer division keeps only the whole part, while the remainder operation keeps only what is left over.

Section C Web Page Structure and Hyperlinks

Part C: 4 marks each, 16 marks in total.

9. In the basic structure of a web page, what does the head part hold and what does the body part hold? [4]

Answer: The head part holds information not shown directly, such as the page title and character encoding; the body part holds the visible text, images and other content.

10. State two elements an anchor used as a hyperlink to the Hong Kong Observatory website should contain. [4]

Answer: It needs an href attribute holding the target address, and visible link text between the opening and closing tags, for example Hong Kong Observatory.

11. Heading tags run from level one to level six; how many levels are there, and why does a page usually use only one level-one heading? [4]

Answer: There are 6 levels; the level-one heading states the main topic of the page, so using only one makes the page topic clear to readers and search engines, while subsections use lower levels.

12. Why should images carry alternative text (alt text)? Give two benefits. [4]

Answer: Alt text appears when an image fails to load and is read out by screen readers so that visually impaired users understand it; it also helps search engines describe the image.

Section D Database Records and Fields

Part D: 4 marks each, 16 marks in total.

13. In a database, what do a record, a field and a primary key mean? [4]

Answer: A record is one whole row of data about an item; a field is one column of the same kind of data, such as name or class; a primary key is a field that uniquely identifies each record.

14. A class data table has 5 columns and 20 records. How many field values are stored in the whole table? [4]

Answer: Number of field values = 5 x 20 = 100.

15. A filter "class = 2A" returns 7 of 20 records. Find the number of records not returned. [4]

Answer: Records not returned = 20 - 7 = 13.

16. Why should the same student name not be stored repeatedly in several tables? Give two reasons. [4]

Answer: Repeated storage wastes space, and any update to a name or class must be made in every copy, which easily leaves inconsistent data; storing it once and linking by a primary key avoids this.

Section E Video File Size Calculations

Part E: 4 marks each, 16 marks in total.

17. A video has resolution 1280 x 720, frame rate 30 fps and colour depth 24 bits. Find the data per second in bits. [4]

Answer: Data per second = 1280 x 720 x 30 x 24 = 663552000 bits.

18. Using the same video, if it lasts 60 seconds, how many bytes does the uncompressed file hold? [4]

Answer: Bytes = 663552000 x 60 / 8 = 4976640000 bytes.

19. Using the same file, what is its size in GB to two decimal places, taking one billion bytes as 1 GB? [4]

Answer: 4976640000 / 1000000000 = 4.98 GB.

20. If the same video is compressed at a ratio of 12 to 1, what is its size in MB to one decimal place, and what is the cost of compression? [4]

Answer: Compressed size = 4976640000 / 12 = 414720000 bytes, about 414.7 MB; the cost is loss of visual or audio detail, and encoding and decoding need extra computing time.

Section F Digital Literacy and Network Use

Part F: 5 marks each, 20 marks in total.

21. What is open source software, and how does it differ from freeware? [5]

Answer: Open source software publishes its source code, so users may read, modify and redistribute it; freeware is merely distributed at no charge and usually keeps its source code private, so the two are not the same.

22. Before reposting another person photo online, what should you check? State two practices. [5]

Answer: Check the licence terms first and keep the source and the author name; do not repost without permission, and contact the author for written consent when needed.

23. To protect an online account, what should be avoided when setting a password? State three points. [5]

Answer: Avoid personal data such as birthdays or phone numbers; avoid sequences or repeated characters such as 123456; avoid reusing one password across sites, and change it regularly.

24. What is the 3-2-1 backup rule, and why should a backup be kept at another location? [5]

Answer: The 3-2-1 rule keeps 3 copies of the data on 2 different types of media with 1 copy off site; an off-site copy survives fire, theft or ransomware that destroys the local files at the same time.
