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Computer science
Standard level
Paper 1

Friday 28 October 2022 (afternoon)

1 hour 30 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Section A: answer all questions.
- Section B: answer all questions.
- The maximum mark for this examination paper is **[70 marks]**.

Section A

Answer **all** questions.

1. State **two** features of a web browser. [2]
2. Construct a truth table for the following expression: [3]
$$(A \text{ XOR } B) \text{ AND } B$$
3. A company is using a prototyping approach as part of their software development process.
 - (a) Outline **one** advantage of prototyping. [2]
 - (b) Outline **one** situation in which the use of a prototype is not the best approach. [2]
4.
 - (a) Identify **two** fundamental operations of a computer. [2]
 - (b) Explain the need for higher level languages. [3]
5. A student posts images and videos on a public website of her friends at a party.
 - (a) Outline **one** ethical issue with the student posting these images and videos. [2]
 - (b) Outline **one** technical issue that may prevent the images and videos from being viewed. [2]
6. Define the term *variable*. [1]
7. Each pixel on a computer screen has three colour values associated with it: red, green and blue. The range for each of the three colour values is from $0_{(10)}$ to $255_{(10)}$.
Colour values can also be represented in hexadecimal. For example, the colour blue can be represented in hexadecimal as 0000FF.
 - (a) State the binary representation of the colour blue. [1]
 - (b) State the number of colours that can be represented in each pixel on the computer screen. [1]

8. Given the one-dimensional array NAMES:

[0]	Zixan
[1]	Murali
[2]	Eli
[3]	Kim

construct a trace table for the following algorithm:

```
K=3
loop while K>=0
  A=K mod 3
  output (NAMES[A])
  K=K-1
end while
```

[4]

Section B

Answer **all** questions.

9. A company has a local area network (LAN). Ethernet (a wired network) and WiFi (a wireless network) are the two ways to enable LAN connections.

The LAN is accessible to all employees through their personal accounts. At the office, employees can use either desktop computers for wired access to the LAN or personal laptops to connect wirelessly.

- (a) Identify **one** additional hardware component in a wireless LAN. [1]
- (b) Distinguish between a wired network and a wireless network in terms of reliability of transmission. [4]
- (c) Outline why a wireless network may be less secure than a wired network. [2]

Employees who are not in the office can access the company's resources over the internet using a virtual private network (VPN).

- (d) Outline **two** features of a VPN that make it secure. [4]

Packet switching is used for transmitting data.

- (e) Explain how data is transmitted by packet switching. [4]

10. An international organization is moving its offices from Africa to Europe. All of its data will need to be moved to a new system.

- (a) (i) Define the term *data migration*. [1]
- (ii) Outline **two** issues that could arise concerning data migration. [4]
- (b) Outline **two** aspects of change management that need to be considered, **other than** data migration. [4]

The organization will continue to maintain the legacy system.

- (c) Explain **one** problem of maintaining legacy systems. [3]
- (d) Explain why parallel running is an expensive changeover method. [3]

11. An integer divisor of an integer, $N (N > 0)$, is an integer greater than zero that divides N without leaving a remainder. The proper divisors of N are divisors of N other than N itself.

For example:

- The divisors of 10 are 1, 2, 5 and 10.
- The proper divisors of 10 are 1, 2 and 5.

(a) (i) State the number of proper divisors of 2. [1]

(ii) State why 4 is not a proper divisor of 10. [1]

Every number can be classified as abundant, deficient, or perfect according to the following definitions:

A number is an **abundant number** if it is less than the sum of its proper divisors. For example, 12 is an abundant number because $1 + 2 + 3 + 4 + 6 = 16$, and $16 > 12$.

A number is a **deficient number** if it is greater than the sum of its proper divisors. For example, 9 is a deficient number because $1 + 3 = 4$, and $4 < 9$.

A number is a **perfect number** if it is equal to the sum of its proper divisors. For example, 28 is a perfect number because $1 + 2 + 4 + 7 + 14 = 28$, and $28 = 28$.

(b) Construct an algorithm in pseudocode that will accept an integer, $K (K > 0)$, and output whether K is an abundant number, a deficient number, or a perfect number. [6]

The one-dimensional array `DATA` holds $X (X > 0)$ elements. Each element in the array is an integer greater than zero.

The subprogram `isAbundant()` is available. It accepts an integer, N , and returns `True` if N is an abundant number, otherwise it returns `False`. For example, `isAbundant(17)` returns `False`.

- (c) Construct an algorithm in pseudocode to:
- determine the number of **abundant** integers in the array `DATA` that are **odd**
 - determine the number of **abundant** integers in the array `DATA` that are **even**
 - output these two numbers.

You should call the `isAbundant()` subprogram.

You can assume that the value of X and the array `DATA` have already been inputted. [7]
