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Computer science
Standard level
Paper 1

Friday 8 November 2019 (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. (a) Identify **one** fundamental operation of a computer. [1]
(b) Distinguish between fundamental and compound operations of a computer. [2]

- 2. (a) Identify **one** cause of data loss. [1]
(b) Describe **one** way offsite storage can be used to prevent data loss. [2]

- 3. (a) State the function of the control unit (CU) in the central processing unit (CPU). [1]
(b) Explain the purpose of cache memory. [3]

- 4. Colours are represented by a computer as a combination of the three primary colours: red, green and blue.

Numerical values are used to represent the different shades of each primary colour. These values range from 0 to 255 in decimal, or 00 to FF in hexadecimal.

(a) State why hexadecimal numbers are frequently used in computing. [1]
(b) State the number of bits used to represent a non-primary colour, such as yellow. [1]
(c) State the maximum number of colours that can be represented in a computer pixel. [1]

- 5. Copy and complete the following truth table where:

$$\begin{aligned} X &= A \text{ XOR } B \\ Y &= A \text{ NOR } C \\ Z &= X \text{ OR NOT } Y \end{aligned}$$

A	B	C	X	Y	Z
0	0	0			

[4]

6. Explain why abstraction is required in the design of algorithms. [3]

7. Construct a trace table for the following algorithm.

```
K = 1
N = 1
M = 2
loop while K < 5
  output (N, M)
  K = K + 1
  N = N + 2
  M = M * 2
end loop
```

[5]

Turn over

Section B

Answer **all** questions.

8. An organization is implementing a new computer system.
- (a) Identify **two** organizational issues related to the implementation of the new system. [2]
- The management considered phased conversion and direct changeover as methods of implementation.
- (b) Evaluate these **two** methods of implementation. [5]
- (c) (i) State **one** type of testing that involves users. [1]
- (ii) Identify **three** consequences of inadequate testing. [3]
- (d) Discuss the social and ethical issues associated with the introduction of a new computer system. [4]
9. (a) Outline **two** advantages of a school using a computer network. [4]
- (b) Describe the purpose of the following hardware components of a network:
- (i) Router [2]
- (ii) Network interface card (NIC) [2]
- (c) Outline why protocols are necessary. [2]
- (d) Define the term *data encryption*. [1]
- (e) Evaluate the use of trusted media access control (MAC) addresses as **one** method of network security. [4]

10. Consider the following algorithm.

```
N = 372
X = N DIV 100
Y = X + 10 * (N MOD 100 DIV 10)
Z = Y + (N MOD 10) * 100
```

- (a) Determine the values of variables X, Y, and Z after execution of this algorithm. Show your working. [3]

NUMBERS is a collection that holds only positive integers.

A three-digit number has three digits: a hundreds digit, a tens digit and a units digit. For example, for 406, its hundreds digit is 4, its tens digit is 0 and its units digit is 6.

An algorithm is needed to copy each three-digit number from the collection NUMBERS, where the hundreds digit is smaller than its tens digit and its tens digit is smaller than its units digit, into a one-dimensional array named THREE. If there are no such numbers in the collection then an appropriate message should be displayed.

For example:

```
If NUMBERS = {9, 3456, 12, 237, 45679, 368, 296}
```

then the contents of the array, THREE, is:

[0]	[1]
237	368

```
If NUMBERS = {1234, 56, 90, 324, 876}
```

then the array THREE is empty and a message such as “No such numbers”, should be outputted.

- (b) Construct this algorithm. You may assume that the array THREE is initialized with a sufficient number of elements. [8]
- (c) Describe how a selection sort algorithm could be used to sort the array THREE in ascending order. [4]