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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:

$$X = A \times B$$

 $Y = A \times C$
 $Z = X \times D \times D \times Y$

| Α | В | С | 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</pre>
```

[5]

Section B

Answer **all** questions.

| 8. | An c | An organization is implementing a new computer system. | | | | | | |
|----|--|--|---|-----|--|--|--|--|
| | (a) | Identify two organizational issues related to the implementation of the new system. | | | | | | |
| | | The management considered phased conversion and direct changeover as methods of implementation. | | | | | | |
| | (b) | Evaluate these two methods of implementation. | | | | | | |
| | (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. | | | | | | | |
| 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. | | | | | | |
| | (d) | | Define the term data encryption. | | | | | |
| | (e) | Evaluate the use of trusted media access control (MAC) addresses as one method of network security. | | | | | | |
| | | | | | | | | |

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.

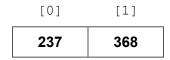
A three-digit number has three digits: a hundreds digit, a tens digit and a units digit. For example, for 406, its hundreds digit is 4, its tens digit is 0 and its units digit is 6.

An algorithm is needed to copy each three-digit number from the collection <code>NUMBERS</code>, where the hundreds digit is smaller than its tens digit and its tens digit is smaller than its units digit, into a one-dimensinal array named <code>THREE</code>. 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:



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]