

Computer science
Standard level
Paper 1

Friday 2 November 2018 (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. Outline what is meant by the term computer network. [2]

2. (a) Outline what is meant by a database management system. [2]
(b) Outline **one** advantage of using beta testing prior to the release of a new product. [2]

3. Direct observation is a technique used by a system analyst to determine user requirements for updating a computer system.
(a) Identify **one** advantage of direct observation. [1]
(b) Identify **one** disadvantage of direct observation. [1]

4. Construct a logic diagram for the following expression.
$$\text{NOT } A \text{ OR } (A \text{ AND } B)$$
 [3]

5. An international company is in the process of moving its Head Office from Europe to Asia.
(a) Identify **two** possible compatibility issues as a part of data migration. [2]
(b) Outline how a virtual private network (VPN) will allow employees who are in Europe to communicate with the Head Office in Asia. [2]
(c) Outline **one** social issue associated with this process. [2]

6. Describe how data is transmitted by packet switching. [4]

7. Construct a trace table for the following algorithm

```
A = 3  
B = 7  
loop while B >= A  
  A = A + 1  
  output(B - A)  
  B = B - 1  
end loop
```

 [4]

Section B

Answer **all** questions.

- 8. (a) (i) Distinguish between random access memory (RAM) and read only memory (ROM). [3]
- (ii) Outline the function of an operating system in managing primary memory. [2]
- (b) Explain the roles of the data bus and the address bus in the machine instruction cycle. [4]
- (c) (i) State how the data stored in the following byte will be represented in hexadecimal. [1]

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 |
|---|---|---|---|---|---|---|---|

- (ii) State how many integers could be represented in this byte. [1]
 - (iii) Outline why this byte could not be used to represent characters such as those used in Chinese. [2]
 - (d) Construct a truth table with two input variables. If the input variables are equal the value of the output variable should be True, otherwise it should be False. [2]
- 9. (a) Outline the need for higher level languages. [2]
 - (b) Explain **two** benefits of using sub-procedures within a computer program. [4]
 - (c) Identify **three** characteristics of a collection. [3]

Collection `NUMBERS` already exists and stores real numbers.

- (d) Construct in pseudocode an algorithm, using the access methods of a collection, which will iterate through the collection `NUMBERS` and count how many elements stored in the collection are in the interval $[-1,1]$.

The final answer should be output. [6]

10. The following method, `calcBMI()` accepts person's height (H) in metres (m) and weight (W) in kilograms (kg) and returns their Body Mass Index (BMI).

```
calcBMI(H, W)
  X = H * H
  B = W / X
  return B
endcalcBMI
```

Boris weighs 104 kg and is 2.00 m tall. His BMI can be calculated by calling method `calcBMI()` as follows

```
BorisBMI = calcBMI(2.00, 104).
```

- (a) State the value of variable `BorisBMI`. [1]

A person can belong to one of the following four weight categories:

| BMI | Weight category |
|-------------------------------|-----------------|
| less than 18.5 | underweight |
| from 18.5 but less than 25.0 | normal weight |
| from 25.0 but less than 30.0 | overweight |
| greater than or equal to 30.0 | obese |

- (b) Use pseudocode to construct an algorithm which accepts a person's BMI and outputs the weight category the person belongs to. [4]

(This question continues on the following page)

(Question 10 continued)

The data about a group of adults and their height measurement (in metres) and weight measurement (in kg) is held in three one-dimensional arrays.

| | NAME | | WEIGHT (kg) | | HEIGHT (m) |
|------|-------------|------|-----------------------|------|----------------------|
| [0] | Annie | [0] | 52.40 | [0] | 1.56 |
| [1] | Boris | [1] | 100.00 | [1] | 2.00 |
| [2] | Hugh | [2] | 105.00 | [2] | 2.03 |
| [3] | Paul | [3] | 61.00 | [3] | 1.75 |
| [4] | Robby | [4] | 88.00 | [4] | 1.80 |
| ... | ... | ... | ... | ... | ... |
| ... | ... | ... | ... | ... | ... |
| [29] | Zara | [29] | 68.00 | [29] | 1.71 |

Where

NAME is a one-dimensional array holding names (currently sorted in alphabetical order).

WEIGHT is a one-dimensional array holding weight measurement in kilograms.

HEIGHT is a one-dimensional array holding height measurement in metres.

For example,

NAME[0] is Annie.

Her weight measurement is 52.40 kg and can be found in WEIGHT[0].

HEIGHT[0] is 1.56 which represents Annie’s height measurement in metres.

- (c) State the name of the person whose height is held in HEIGHT[3]. [1]

- (d) (i) Identify **one** reason why a binary search algorithm cannot be used to find the name of person whose height is given. [1]
- (ii) Describe how the name of person whose height is given could be output. [2]

- (e) Construct an algorithm which will output the names of all the people whose BMI is greater than this group’s average BMI.

You should call method calcBMI() in your answer. [6]
