Diploma Programme
Programme du diplôme
Programa del Diploma

Computer science
Standard level
Paper 1

Friday 4 May 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]**.

2218–7014

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Section A

Answer **all** questions.

1.   A new computerized system is being planned for a school library.

    (a)   Describe **one** method by which systems requirements can be obtained from the stakeholders.   [2]

    (b)   Outline **one** reason for providing a prototype for this new system.   [2]

2.   Outline the role of the memory data register in the machine execution cycle.   [2]

3.   Calculate how many different colours can be represented using two hexadecimal characters.   [2]

4.   Explain the importance of the memory management function of an operating system.   [3]

5.   Construct a logic diagram for the following Boolean expression.

                                NOT A OR (A AND B)   [3]

6.   Identify **two** characteristics of a data packet.   [2]

7.   Explain why protocols are used in network communications.   [3]

8. Consider the following algorithm.
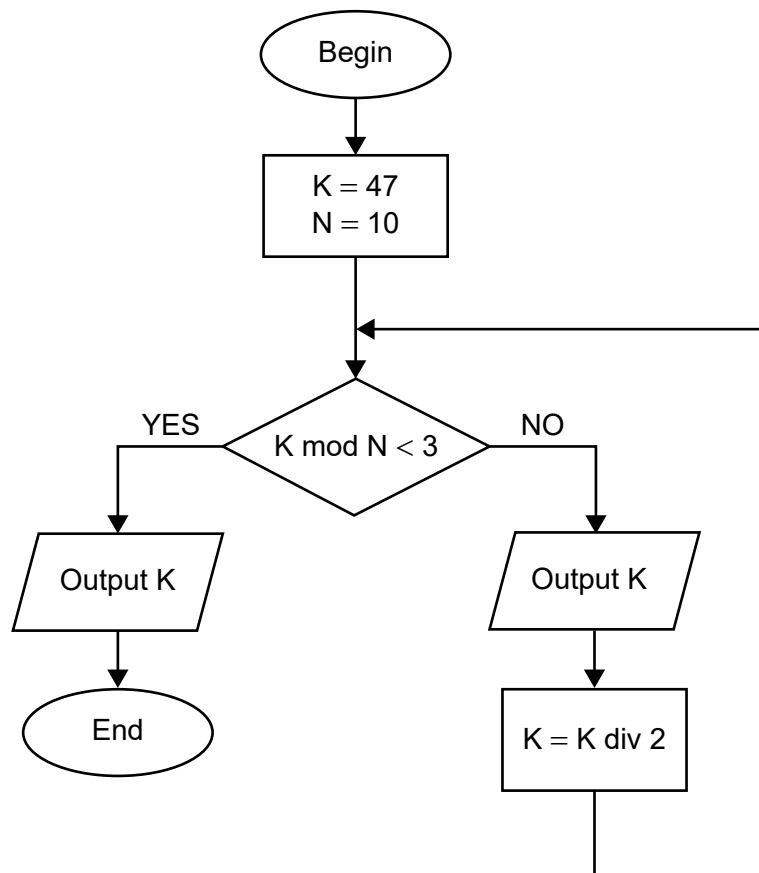
Determine the outputs that will be produced by this algorithm. [3]

9. For an identified application, explain why a binary search would be preferred to a linear search. [3]

Section B

Answer **all** questions.

10. A medical centre uses a computer system to manage both patients' data and appointments. This system, which is used by the doctors, nurses and secretaries, has two unordered files: a patients' file and an appointments' file, both of which can only be accessed sequentially.

    Every evening the following processing takes place:

    • a list of appointments for the next day is printed out
    • reminders are sent by SMS text messages to the patients' mobile devices.

    (a) Outline the pseudocode that the processing must follow when the system sends out the text reminders. [5]

    (b) Describe **two** different methods that the medical centre could use that would allow data to be restored should it be lost for any reason. [4]

    The medical centre is concerned about the privacy of the data it is storing and has to make decisions concerning:

    • access to the data stored on this system
    • storing the data locally or through the use of a cloud service.

    (c) Discuss the issues that should be considered before making these decisions. [6]

11. A company has expanded its office space into nearby rooms and has decided to set up a local area network (LAN) to support its operations.

The LAN will connect the room where the server is installed to new computers in the additional office space. The network engineer produced the following Gantt chart for this task.

TASK NAME	1	2	3	4	5	6	7	8	9	10
Lay ducts for new cables	■	■								
Lay cables inside the ducts			■	■	■					
Install connectors on wall of server room						■	■			
Install connectors on wall of new office space						■	■			
Test the cabling								■	■	
Connect the new computers with the cabling									■	■

(a) Define the term *concurrent processing*. [1]

(b) Identify **two** tasks that will be carried out concurrently. [1]

(c) Identify **two** tasks that will be carried out sequentially. [1]

After 5 years the company decided to replace the LAN with a wireless local area network (WLAN).

(d) Outline **two** advantages, to this company, of installing a WLAN. [4]

A WLAN will introduce additional security issues for the company.

(e) Discuss any **two** of these issues and the ways in which the company might resolve them. [4]

The company is considering expanding their network to allow employees to connect from anywhere in the world. The expanded network would need to provide security and allow the employees full functionality of the internal network.

(f) Explain how setting up a virtual private network (VPN) would provide a suitable solution. [4]

Turn over

12. (a) The collection `DATA` contains the following data:

$$2, \ 4, \ 1, \ -2, \ -4, \ 1, \ 0$$

Consider the following pseudocode:

```
COUNTER = 0
SUM = 0
DATA.resetNext()
loop for X from 0 to 6
  if DATA.getNext() > 0
    ARRAY[X] = DATA.getNext()
    COUNTER = COUNTER + 1
    SUM = SUM + ARRAY[X]
  end if
end loop
output SUM/COUNTER
```

Trace the pseudocode using the table below: [4]

X	ARRAY[X]	COUNTER	SUM	output

A transport authority is investigating how many people use a certain direct train route, which is used every day of the week.

At the end of each day, the total number of passengers who travelled on this route is stored in a collection, `PASSENGERS`.

The first item was written to the collection on Monday 1st January 2018.

The next items, collected on Tuesday and Wednesday, were added like this:

(b) Assuming that the first item read from the collection is from Monday 1st January 2018, construct pseudocode that will read `PASSENGERS` into an array, `P_ARRAY`.   [4]

(c) Using `P_ARRAY`, construct pseudocode to output the day of the week with the highest average number of passengers. Use the sub procedure `convert()` which converts the numbers 0 to 6 into days of the week, for example `convert(1)` will return "Tuesday".

Note: you should <u>not</u> assume that data for an exact number of weeks is stored.   [7]