



**COMPUTER SCIENCE
HIGHER LEVEL
PAPER 1**

SPECIMEN PAPER

2 hours 10 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.

SECTION A

Answer *all* questions.

1. State **one** example of *application software*. [1 mark]
2. Identify **two** methods that can be used to prevent data loss. [2 marks]
3. Identify **two** methods of providing *user documentation*. [2 marks]
4. Outline the need for higher level languages. [2 marks]
5. State **one** function of the *operating system* in managing memory. [1 mark]
6. Construct a *logic diagram* for the Boolean expression
A AND B OR NOT B. [3 marks]
7. Define the term *recursion*. [1 mark]
8. Consider the following array

NAMES	[0]	[1]	[2]	[3]	[4]
	Robert	Boris	Brad	George	David

and the following algorithm, which is constructed to reverse the contents of the array NAMES.

```

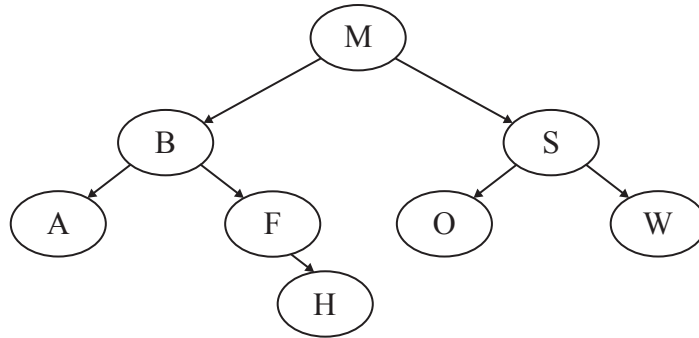
N = 5 // the number of elements in the array
K = 0 // this is the first index in the array

loop while K < N - 1
    TEMP = NAMES[K]
    NAMES [K] = NAMES [N - K - 1]
    NAMES [N - K - 1] = TEMP
    K = K + 1
end loop
    
```

- (a) Trace the algorithm, showing the contents of the array after each execution of the loop. [2 marks]
- (b) Identify the type of error that occurs. [1 mark]
- (c) Outline why the error occurs and how it could be corrected. [2 marks]

9. (a) Outline the differences between a LAN and a VLAN. [3 marks]
- (b) Identify **two** factors that should be considered when selecting transmission media. [2 marks]

10. Consider the following binary search tree.



- (a) State the order in which data will be listed using *preorder* traversal. [1 mark]
- (b) State the number of leaf nodes in the tree. [1 mark]
- (c) Construct the tree after adding the node L. [1 mark]

SECTION B

Answer *all* questions.

11. The temperature (in °C) of a lake was recorded every hour, every day, for one week. As each reading was taken, it was added sequentially to the collection `TEMPERATURES`, which is stored permanently.

At the end of the week this data was read into a two-dimensional array named `TEMPWEEK` as shown below.

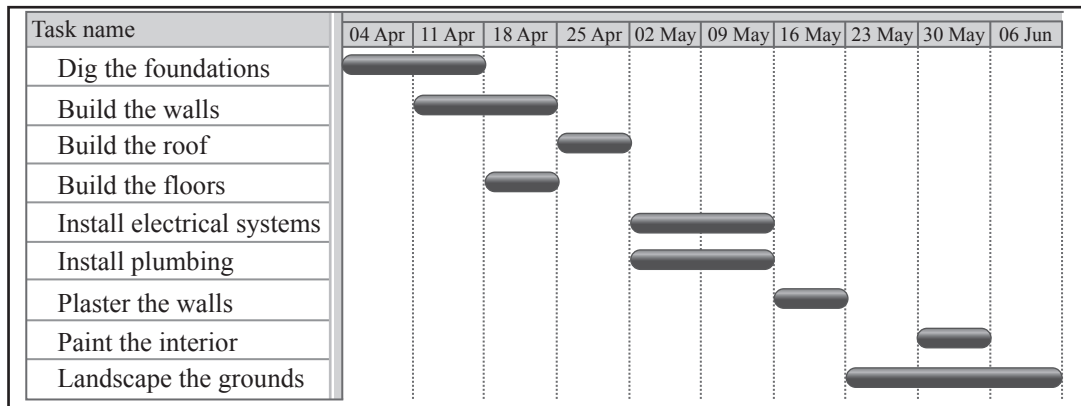
		Monday	Tuesday	...	Sunday
hours	indices	[0]	[1]	...	[6]
00:00	[0]	12.4	12.3		12.6
01:00	[1]	12.3	12.3		12.5
⋮	⋮				
16:00	[16]	12.9	12.9		12.9
17:00	[17]	13.0	13.0		13.0
18:00	[18]	13.1	13.1		13.1
⋮	⋮				
22:00	[22]	12.3	12.3		12.3
23:00	[23]	12.3	12.3		12.3

- (a) Construct the algorithm that will read the data from the collection into the array. You can use the collection functions `TEMPERATURES.getNext()` and `TEMPERATURES.isEmpty()`. [5 marks]
- (b) Using the array `TEMPWEEK`, construct an algorithm to determine and output the minimum temperature for the week. [4 marks]
- (c) If the temperature is less than 12.0 °C then the day, time and temperature are also placed in a separate data structure.
- (i) Describe a **dynamic** data structure that might be used to hold this data. You may use a labelled diagram. [3 marks]
- (ii) Using this dynamic structure suggest how the number of days when the temperature of the lake was below 12.0 °C can be found. [3 marks]

12. A business has decided to replace their current computer system with a new computer system.
- (a) Identify **three** examples of how employees, as users of the computer system, may participate in the development of the new system. [3 marks]
- (b) One method of conversion from the old computer system to the new computer system is parallel running.
- (i) Define the term *parallel running*. [1 mark]
- (ii) Identify **one** other method of conversion. [1 mark]
- (iii) Compare parallel running with the method of conversion identified in part (ii). [4 marks]
- (c) The data from the old computer system needs to be transferred onto the new computer system. Discuss **two** problems that may arise as a result of this data migration. [6 marks]

13. Señor Rodriguez is having a new house built and will require local tradesmen to complete a number of tasks.

The Gantt chart below shows the tasks involved in the building of the house.



- (a) Define the term *concurrent processing*. [1 mark]
- (b) Identify **two** tasks that are carried out concurrently. [1 mark]
- (c) Identify **two** tasks that are carried out sequentially. [1 mark]
- (d) Describe how the idea of abstraction applies to one of the tasks. [2 marks]
- (e) Explain **one** advantage and **one** disadvantage of carrying out a number of tasks concurrently. [4 marks]

Amalia Rodriguez, his daughter, is a student and is completing her homework. This requires her to view web pages, edit a document, and print out draft copies.

However, she is also surfing the web, keeping up to date on her social networking site as well as downloading apps and music from a P2P site.

- (f) For one of the application programs which she uses to perform these activities, outline **one** task that is carried out by the application program itself. [2 marks]

Within the application the graphical user interface (GUI) elements are reliant on the operating system.

- (g) Identify **two** GUI components that are common to all of the above and are carried out by the operating system. [2 marks]
- (h) Outline how the use of abstract GUI components simplifies application programming. [2 marks]

14. The operating system in the latest mobile phones allows the user to open more than one application at the same time.

(a) State **three** possible applications that might be open at the same time. *[1 mark]*

(b) Explain the role of the operating system in the management of these applications. *[4 marks]*

The intended uses of a mobile phone influence its design with regard to system resources.

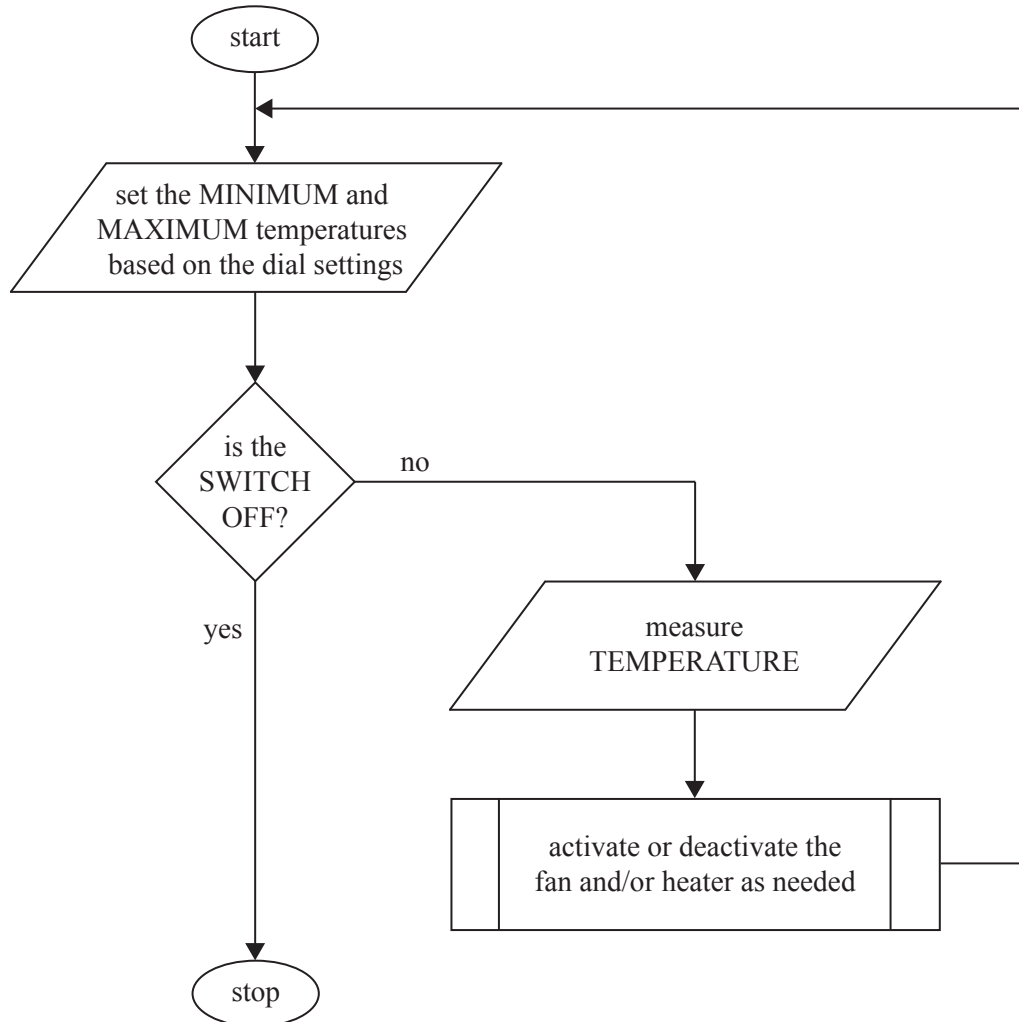
(c) With reference to **two** specific resources, outline how the design of these resources for a mobile phone would differ from those of a standard PC. *[4 marks]*

A mobile phone manufacturer is considering adding a graphics card to one of its models.

(d) Discuss the possible consequences of going ahead with this modification. *[6 marks]*

15. A company uses computer controlled equipment to monitor and control a heating system. The user controls the system via an on/off switch and two dials that are used to set the maximum and minimum temperatures desired.

The following flowchart represents the algorithm used to control temperature.



The temperature is constantly measured and the process of making the decision on which action to take is as follows.

If it is too cold (temperature is less than the minimum) then the heater should be switched on. If it is too hot (temperature is greater than the maximum) then the fan should be switched on. If temperature is within the given range (temperature greater than the minimum and less than the maximum) then both the fan and heater should be switched off.

(This question continues on the following page)

(Question 15 continued)

- (a) Identify **one** situation in which the system should respond to
 - (i) input from a user; *[1 mark]*
 - (ii) temperature. *[1 mark]*
 - (b) State **three** hardware devices that are needed to capture the input data and produce the system outputs. *[3 marks]*
 - (c) Construct pseudocode for the algorithm outlined on the previous page. *[4 marks]*
 - (d) The company wants to use its heating system to control the temperature of ten different places at the same time. All ten places will have the same maximum and minimum temperatures and each will have its own heater, fan, and temperature sensor. Evaluate the decision of having all ten temperature sensors, fans, and heaters connected to a single control computer instead of having ten separate heating systems. *[6 marks]*
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