

## COMPUTER SCIENCE STANDARD LEVEL PAPER 2

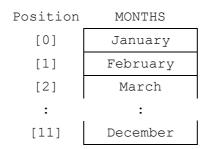
Thursday 15 November 2001 (morning)

1 hour 45 minutes

## INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Answer all the questions.

1. Some programming languages define arrays as starting at position zero rather than position one. Consider the following array MONTHS:



The following algorithm is meant to take a month as a parameter and convert it from its text description to the correct month number; for example, if the parameter is the string "February" the function should return the integer value 2. (You may assume that any string passed to MONTHNUMBER is a valid entry in the array MONTHS.)

```
function MONTHNUMBER(val SMONTH string)
result integer
/*SMONTH is a pass-by-value parameter*/
declare P integer
P <-- 0
while SMONTH # MONTHS[P] and P<11 do
        P <-- P + 1
enddo
return P
endfunction MONTHNUMBER</pre>
```

(a) Copy and complete the trace table below for the call  ${\tt MONTHNUMBER(``March'')}$  .

| SMONTH  | P | MONTHS[P] | SMONTH # MONTHS[P] |  |  |
|---------|---|-----------|--------------------|--|--|
| "March" | 0 | "January" | true               |  |  |
| :       | : | :         | :                  |  |  |

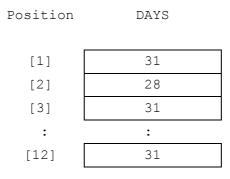
[4 marks]

(b) Explain how the algorithm should be changed to give the correct return. [2 marks]

(This question continues on the following page)

## (Question 1 continued)

(c) A new array, DAYS, is set up as follows:



The number of days in January is stored in position 1, the number of days in February is stored in position 2 and so on.

Construct the algorithm for the function TOTAL which has parameters of a month and a day in that month. It will return the number of days since the start of the year. For example, **output** TOTAL("March", 10), would display 69.

(If the month is **not** valid **or** the day is **greater than** the corresponding value in the DAYS array, the return value should be -1. Examples of invalid parameters are ("Jobble",10) and ("February",30). You may use the function MONTHNUMBER assuming it has been corrected as answered in part (b).)

[12 marks]

(d) Using either a Bubble Sort or a Selection Sort, construct an algorithm which will sort the array MONTHS into alphabetical order.

[12 marks]

This question requires the use of the Case Study.

| 2. | (a) | State <b>one</b> advantage and <b>one</b> disadvantage of the data input at collection sites, such as barometer and thermometer readings, being automated.                     | [2 marks] |
|----|-----|--|-----------|
|    | (b) | Describe <b>two</b> error-checking methods that could be used when data is transmitted from the local data collection site to the National Weather Service (NWS) headquarters. | [4 marks] |
|    | (c) | Describe METAR format and explain how it is converted by the local television stations into a weather forecast.  | [3 marks] |
|    | (d) | Compare the use of 6250 bpi tapes with robotics high-density storage system in the storage and retrieval of archived data.   | [6 marks] |
|    | (e) | State two uses of archived data and discuss their effect on society.   | [6 marks] |
|    | (f) | Identify <b>two</b> factors that could cause a super computer to give a false weather forecast and suggest how the risk of this happening could be reduced.                    | [4 marks] |

| (a) | (i)   | Define the term <i>single-task process</i> .   | [1 mark]  |  |  |
|-----|---|--|-----------|--|--|
|     | (ii)  | Identify a single-task process in the above situation.   | [1 mark]  |  |  |
| (b) | Describe <b>two</b> possible output formats (and the devices required) for the presenters to use.   |  |           |  |  |
| (c) | Drav  | w the systems flowchart for the situation described.   | [6 marks] |  |  |
|     | The employees of the local television station also use the computer system for several administrative tasks such as word processing and desktop publishing. |  |           |  |  |
| (d) |   | cribe how <i>multi-tasking</i> may be used within the system, with reference specific example. | [3 marks] |  |  |