INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

MARKSCHEME

November 2001

COMPUTER SCIENCE

Standard Level

Paper 2

10 pages

1. (a)

SMONTH	P	MONTHS(P)	SMONTH # MONTHS(P)
"March"	0	"January"	true
"March"	1	"February"	true
"March"	2	"March"	false

*Allocate **[2 marks]** for each correct line (obviously the last two lines only as the rest is given in the question). One mistake in a line gives **[1 mark]** and two mistakes gives zero.*

(b) return `P+1` instead of `P` ***[2 marks]***

(c) One possibility is as follows:

```
function TOTAL(val SMONTH string val NDAYS integer)
   result integer
   declare I, N, P integer
   N<-- MONTHNUMBER(SMONTH)
   if N>12 or NDAYS>DAYS(N) then return -1
      else P<-- 0
            for I= 1 upto N-1 do
                  P<-- P+ DAYS(I)
            endfor
            P<-- P+NDAYS
endif
return P
endfunction TOTAL
```

Algorithms may vary but marks can be allocated in the following way:

pass by value of `SMONTH` and `NDAYS` ***[1 mark]***
declaration of variables used in function ***[1 mark]***

correct call to `MONTHNUMBER` ***[1 mark]***
check on validation of result ***[1 mark]*** and `NDAYS` ***[1 mark]*** return `-1` if neither valid ***[1 mark]***
putting `P` to zero before the loop ***[1 mark]***
correct pass through `DAYS` up to `N-1` ***[2 marks]*** accumulating number of days ***[1 mark]***
add on `NDAYS` ***[1 mark]***

correct return ***[1 mark]***

(d)
```
declare FIRST,SMALLPOS,CURRENT integer TEMP string
for FIRST = 1 upto 11 do
   SMALLPOS<-- FIRST
   CURRENT<-- SMALLPOS+1
      while CURRENT#12 do
         if MONTHS(CURRENT)<MONTHS(SMALLPOS)
            then SMALLPOS< -- CURRENT
               CURRENT< -- CURRENT+1
         endif
      endwhile
TEMP<-- MONTHS(FIRST)
MONTHS(FIRST)<-- MONTHS(SMALLPOS)
MONTHS(SMALLPOS)<-- TEMP
endfor
```

Looping may be implemented differently but essentially points should be allocated as follows:

Loop from 1 to 11	***[1 mark]***
allocate `SMALLPOS` and `CURRENT`	***[2 marks]***
loop until the end of array	***[1 mark]***
correct test for `MONTHS(CURRENT)<MONTHS(SMALLPOS)`	***[1 mark]***
place `CURRENT` in `SMALLPOS`	***[1 mark]***
increment `CURRENT`	***[1 mark]***
correct end of loop	***[1 mark]***
swap `MONTHS(SMALLPOS) with MONTHS(FIRST)`	***[2 marks]***
correct end of loop	***[2 marks]***

2. (a) very small change in one element (for example wind) can have effect on all other elements ***[2 marks]***
small change in elements can affect the time and place that weather will arrive ***[2 marks]***
the equations have to be continually fed with these variables to give latest changes and cannot predict what next change will be ***[2 marks]***
prediction equations are too simple and use too few variables to hold for more than a short period ***[2 marks]***

Any of the above and many more are acceptable. Give ***[1 mark]*** *for reason and* ***[1 mark]*** *for explanation.*

(b) short term uses fewer variables and restricted number of equations ***[1 mark]*** whereas long term includes many complex equations and many more variables ***[1 mark]***
short term is repeated on measurements as they are sent now ***[1 mark]*** long term uses archived data and statistics ***[1 mark]***

(c) One advantage ***[1 mark]*** justified ***[1 mark]*** and one disadvantage ***[1 mark]*** justified ***[1 mark]***.

For example, an advantage is that changing secondary storage would mean:
- more storage
- taking less space
- easier to mount/dismount
- quicker to access

Disadvantages:
- not compatible with archived data so far
- means rewriting all the old data onto new medium
- could mean changing software

(d) sending data from collection centre to central computer ***[1 mark]*** or to regional television company ***[max 1 mark]***

(e) ***[1 mark]*** *for each of the following points* ***[max 4 marks]***
- set up equations to accept data
- feed in current variables
- compare forecast with what actually happens
- repeat over a period time that covers a wide range of seasons, temperature, humidity *etc.*
- take archive data
- from a wide range of conditions
- feed variables into model
- compare forecast with the known resultant climate

(f) *Accept any of the following characteristics **[1 mark]** with reason for which suitable **[1 mark]**. Do not give more than **[4 marks]** for characteristics or **[4 marks]** for reason. **[max 8 marks]***

- parallel processing or pipelining needed to perform millions of calculations
- precision arithmetic since calculations complex and small errors could mean different forecast
- large immediate access store (accept RAM) needed for the number of variables and results that have to be processed
- fast processing speed since each calculation is complex
- front end processor to deal with input and output of enormous number of variables and results

(g) *Give **[1 mark]** for correct online and **[1 mark]** for correct batch process.*
On line process:
- would be the acceptance of data from the collection points

Batch process could be:
- sending the current forecast after manipulation to the television centres at a set time each day
- archiving data at a set time each day/week

(h) ***[1 mark]** for any of the following:*
- no need to since data not secret
- does not mean anything until put together with the rest of the data
- saves time in sending and receiving
- too much data to slow down with encrypting/decrypting

(i) Data sent to regional television centres ***[1 mark]*** then resent to their own analysts ***[1 mark]***.

3. (a) (i) A single task process is one where the computer is running one program at a time. ***[1 mark]***

(ii) collecting and sending of data from the instruments ***[1 mark]***

(b) text to be read out ***[1 mark]*** by printer ***[1 mark]***
pictorial output imposed on map of region ***[1 mark]*** video/screen output ***[1 mark]*** ***[max 4 marks]***

(c) data input from extra instruments ***[1 mark]*** from data vendors ***[1 mark]***
processing ***[1 mark]*** labelled ***[1 mark]***
output to printer ***[1 mark]*** output to screen ***[1 mark]*** ***[max 6 marks]***

(d) Give ***[1 mark]*** for specific example and ***[2 marks]*** for description.

Multi-tasking between processing the weather data, word processing a document, creating DTP document
[1 mark] for giving two of the above processes that could be taking place

[1 mark] for any of the following ***[max 2 marks]***
- system performs one process for a fixed time or until interrupt
- stores relevant data and addresses
- moves to second process and repeats
- user unaware that there has been a swap since rapid compared to user

Example may be included in description or stated separately.