INTERNATIONAL
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BACCALAUREATE
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MARKSCHEME

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COMPUTER SCIENCE

Standard Level

Paper 2

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.