INTERNATIONAL
BACCALAURÉAT
BACHILLERATO

IB

BACCALAUREATE
INTERNATIONAL
INTERNACIONAL

MARKSCHEME

November 2001

COMPUTER SCIENCE

Higher Level

Paper 2

12 pages

1.　(a)　2 *[1 mark]*
algorithm gives array position *[1 mark]* instead of month number *[1 mark]* *[max 3 marks]*

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

(c)
```
procedure ADDHOURS
    declare P,Q integer; SMONTH string
    for Q=0 upto 11 do
    HOURS(Q)<--0
    endfor
    SMONTH=""
    input SMONTH
    while SMONTH#"ZZZ" do
       P<--0
       while SMONTH #MONTHS(P) do
          P<-- P+1
       enddo
       HOURS(P)<-- HOURS(P) +1
    input SMONTH
  enddo
endproc
```

The above is only one possible solution. Candidates can use the given function MONTHNUMBER but it needs to be in the original form or P adjusted again if not.

Award marks as follows:
initialise the array HOURS *[1 mark]*
input month name *[1 mark]*
check for terminator *[1 mark]*
find month number *[1 mark]*
increment correctly *[1 mark]* *[max 5 marks]*

(d)　*Award marks for each point as follows.* The way in which candidates express each point is not important as long as the strategy is clear.

- Input the month name and count the number of letters it contains (*i.e.* use LEN$(SMONTH) *[1 mark]*
- for each entry in MONTHS *[1 mark]*
    - initialise count
    - for each letter in SMONTH *[1 mark]*
        - compare with same POS letter in MONTHS *[1 mark]*
        - if the same increment count *[1 mark]*
    if count $>.8*$LEN return month number and exit *[1 mark]*
  return -1 *[1 mark]* *[max 7 marks]*

(e)　There are a few possibilities May and March similar for example, June July. Small number of letters would mean no chance of detecting *e.g.* Mag has only 66% the same as May *[1 mark]*

(f)
```
MID<-- HOURS(5)
LEFT<--0
RIGHT<--11
QUICKSORT(LEFT,RIGHT,MID)

procedure QUICKSORT(ref LEFT, RIGHT, MID integer)
   while RIGHT>LEFT do

      while HOURS(LEFT)<MID do
         LEFT<--LEFT+1
      endwhile
      while HOURS(RIGHT)>MID do
         RIGHT<--RIGHT-1
      endwhile
      TEMP<--HOURS(RIGHT)
      HOURS(RIGHT)<--HOURS(LEFT)
      HOURS(LEFT)<-- TEMP
      LEFT<-- LEFT+1
      RIGHT<RIGHT-1
   endwhile
   if RIGHT>0 then
   LEFT<-- 0
   QUICKSORT(LEFT,RIGHT,MID)
   endif
   if LEFT< 11 then
   RIGHT<--11
   QUICKSORT(LEFT, RIGHT,MID)
   endif
endproc
```

Allocate marks as follows:

initial setting of LEFT, RIGHT and MID *[1 mark]*
pass by reference of parameters LEFT and RIGHT *[1 mark]*

correct LEFT <RIGHT loop *[1 mark]*
correct loops to increment RIGHT and LEFT *[2 marks]*

swap of values at RIGHT and LEFT *[1 mark]* correctly *[1 mark]*
RIGHT and LEFT incremented/decremented *[1 mark]*

test for RIGHT and LEFT set to end *[1 mark]*
test for LEFT and RIGHT set to start *[1 mark]*

Any recursive call [1 mark] correct [1 mark].

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)   Row 999 *[1 mark]* column 2 *[1 mark]*

        (b)   (i)   A clash occurs when the hashing algorithm gives the same address *[1 mark]* for
                more than one record *[1 mark]*

                (ii)   Any key field that ends in 001 for example, 12001 *[1 mark]*

                (iii)   Any good strategy *[1 mark]* explained with reference to HASH *[1 mark]*. *Accept
                only **two** strategies.*
                For example:
                •   increase the number of rows and send clashes to the extra space
                •   create an overflow array and send overflows there
                •   create a list of pointers giving overflow address for each row *[max 4 marks]*

        (c)   *[1 mark] for each of the following points [max 4 marks]*
                •   generate address by hashing algorithm
                •   go to head node
                •   follow pointers until address found
                •   insert address
                •   adjust pointer of previous address to point to new one
                •   give pointer to next address

        (d)   *Give [1 mark] for advantage and [1 mark] for explanation.*
                Takes less storage since array could have many empty spaces that are never used.
                Do not accept faster.

4.   (a)   *[1 mark]* for appropriate task and *[1 mark]* for brief description.

For example:
- serves input and output devices
- loads software into memory when requested
- organises storage of program and data files in memory
- controls access to secondary storage
- handles interrupts from peripherals and other sources

(b)   (i)   *[1 mark]* *for each of the following points* *[max 3 marks]*
- Virtual memory is the use of secondary storage
- as if it were part of primary storage.
- Part of the data normally held in RAM is actually stored on, for example, disk
- addressed in the same way as RAM but with paging.

(ii)   *[1 mark]* *for stating an advantage and* *[1 mark]* *for brief description.* *[1 mark]* *for stating a disadvantage and* *[1 mark]* *for brief description.*

- simpler to run larger programs
- and more complicated operating systems
- which cannot be held in primary memory
- slower than using only primary storage since addressing is more complicated
- transfer speed from disk slow compared with RAM

5.   (a)   *Accept any reasonable. Most likely is fibre optic* **[max 1 mark]**

   (b)   *Accept* **[1 mark]** *for each of following* **[max 4 marks]**
   - request sent to server with IP address of work station
   - student logged on with own user name file area accessed on server
   - permission on file checked with username
   - if correct file sent to workstation

   (c)   *Accept* **[1 mark]** *for each of following* **[max 3 marks]**
   - by issuing each user with username
   - maintaining security of passwords
   - setting permissions on files on the server

   (d)   *Allow* **[1 mark]** *for each of the following points* **[max 3 marks]**
   - part of data from disk on server transferred to memory and sent to workstation
   - either when buffer full or on interrupt
   - brochure data sent to printer buffer
   - process repeated giving impression that the two are happening at the same time
   - in fact each task gets a short burst of time until finished

   (e)   **Advantages:** **[1 mark]** *for each*
   - tidier with fewer wires
   - less chance of breakdown

   Disadvantages: **[1 mark]** *for each*
   - very costly to install
   - if there is breakdown more costly to repair?
   - Infrared is directional. Difficult to get them all to have access to hub.

   Only accept **two** advantages and **two** disadvantages **[max 4 marks]**