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Cambridge International Advanced Level

MARK SCHEME for the October/November 2014 series

9691 COMPUTING

9691/32   Paper 3 (Computing), maximum raw mark 90

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1 **(a) (i)** `x y - 4 /`   **[1]**

    (ii) `3` <u>`2 x 7 / +`</u> `*`
               `1`

    Or

    <u>`2 x 7 / +`</u> `3 *`
       `1`   **[2]**

  (b) (i)   `4 * (a + b + c + d + e)`
      Accept   Omission of the *
      Extra brackets as long as the evaluation is correct   **[1]**

    (ii) $(y^2 + z^3)$ `/ 5`
         <u> </u>or<u> </u>
          1
      Accept   `(y^2 + z^3) / 5`   scores 1 only   **[2]**

  (c) (i) Last item added is the first to leave // first add will be the last to leave
      Last in – First out // First in – Last out
   NE LIFO   **[1]**

    (ii) Storing return addresses for procedure/function calls

      Software focussed
      Dealing with the 'Undo' feature in a software application
      Printing the pages from a document in reverse order   **[1]**

  (d) (i) First item added will be the first item to leave //
      First in – First out
      NE FIFO   **[1]**

    (ii) Storage of characters codes in a keyboard/printer buffer
      Accept   buffer<u>ing</u>
      Organisation of <u>spooler</u> jobs in a print spooler
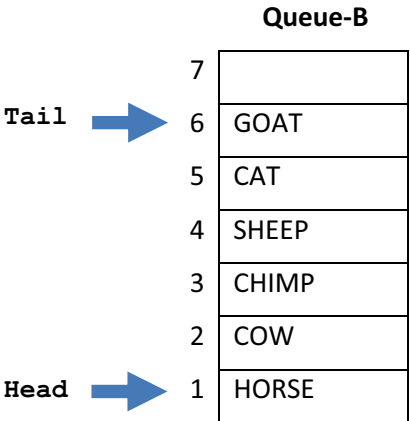   (High-level) scheduling (in a multiprogramming OS)   **[Max 1]**

(e) (i)

Stack-A

TOS → 7 [ ]
6 | HORSE
5 | COW
4 | CHIMP
3 | SHEEP
2 | CAT
1 | GOAT
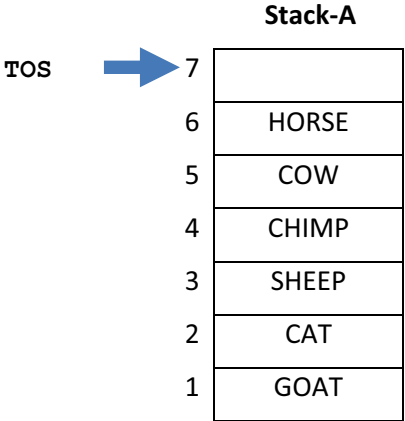
TOS points to 7
6 data items in correct order   **[2]**

(ii)

Queue-B

7 [ ]
Tail → 6 | GOAT
5 | CAT
4 | SHEEP
3 | CHIMP
2 | COW
Head → 1 | HORSE

Six values in correct positions   1
Tail = 6   1
Head = 1   1   3

(iii)

Stack-A

7 [ ]
6 [ ]
5 [ ]
TOS → 4 [ ]
3 | CHIMP
2 | COW
1 | HORSE
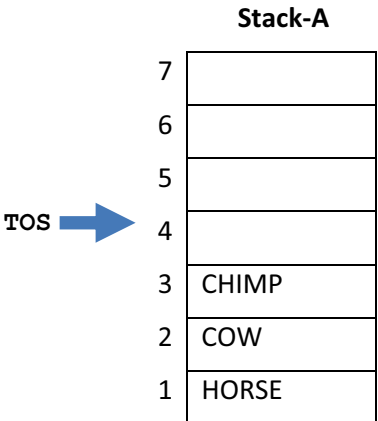
TOS points to 4   1
3 data items in correct order   1   **[2]**

(iv) Reverse the order of items on Stack-A   **[1]**

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2 (a) (i) Pages are managed using a page-map / management table (PMT)
Existing page(s) will be swapped out
Following a particular strategy for deciding which ones
The page containing the (printing) code required is swapped in

Accept for 1 mark only - a description of pages being 'swapped' **[Max 3]**

(b) (i) Round robin
'priority' which is well explained and clear
e.g. Anticipated shortest time to complete

Refuse Priority for either CPU bound or I/O bound **[Max 2]**

(ii) *Processor bound*
Continuously using the CPU // spends very little time doing I/O
                          1

processing of 3-D graphics //Simulation//weather forecasting processing //
Refuse 'mathematical calculations'   1

I/O Bound
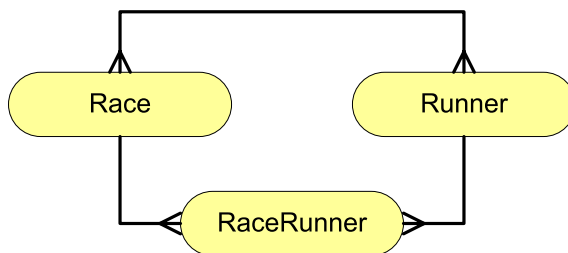Continuously doing I/O // needs very little CPU time   1

File update // Processing the company payroll (where a lot of output is required)
                          1   **[4]**

(c) CF / FC
EB / BE
DA / AD   for MAX 2

correct sequence   1
(conditional on the 3rd mark …) CF matched with DA // FC matched
with AD   1   **[4]**

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3 (a) (i)

RaceRunner(RaceDate, RunnerID) **[2]**

(ii)

2 X correct relationships **[2]**

(b) (i) *Not in 2 NF*
RaceRunner // 3 **[1]**

RunnerName is only dependant on knowing part of the PK (i.e. the **[1]**
RunnerID) // there is a non-key attribute which is dependent on only
one of the PK attributes

RaceRunner(RaceDate, RunnerID FinishingPosition) **[1]**
All correct ..

(ii) *Not in 3NF*
Race // 2 **[1]**
Since there are dependent non-key attributes //
ClubSecName and ClubTown are both dependent on
ClubName **[1]**

Re-design
Race(RaceDate, RaceDistance, ClubName) **[1]**

New table Club … **[1]**
Club(ClubName, ClubTown, ClubSecretaryName) **[1]**

(c) (i) SELECT RunnerID **[1]**
FROM RaceRunner **[1]**
WHERE RaceDate = #26/11/2014# **[1]**

(ii) UPDATE RaceRunner **[1]**
SET FinishingPosition = 2 // 2nd (place) **[1]**
WHERE RaceDate = #26/11/2014# AND RunnerID = 8816 **[1]**

4 (a) (i) 256 **[1]**

(ii) Load into the ACC
(The number) 193 // 11000001 **[2]**

(iii) Fewer digits to write // less chance of an error in writing the code // **[1]**
easy conversion to/from a binary code

(iv) `05C1 hex` **[1]**

(v) `JPE 204`

1	1	1	0	0	1	1	1	1	1	0	0	1	1	0	0

Op code   1
Operand   1 **[2]**

(vi) True
`OUTCH` // `IN` // `END` // or using a good explanation (only) of either **[2]**

(b)

ACC	Address 450	OUTPUT
65		A
500		
501	501	
74		J
501		
502	502	
65		A
502		
503	503	
90		Z
503		
504	504	
32		

[5]

5 (a) Takes as input a source program
Process identifies errors in the source code
Produces an executable file // object code // machine code
Translation software are not needed at run-time
Use lookup tables/symbol tables   **[Max 2]**

Refuse 'in one go' / 'all at once'

(b)

F		F		
H		H		
B		B		
C		C		
A		A		

Mark as follows:

Look for F – H – B – C – A for full five marks

Or

Not used is D - Run the assembler with the executable code   1

F at the start   1
HB   1
CA   1
Correct sequence of these three blocks   1   **[5]**

(c) (i) Interpreters usually provide better diagnostics / easier to debug /or by example
Note: Must hint at a comparison with a compiler so Refuse 'easy to debug'   1

Using an interpreter will allow some parts of the program (only) to be tested and run // without all the program code being available
                                                                     1

Fits with the strategy of a modular approach (to program design and coding).   1   **[Max 2]**

(ii) The interpreter software must always be present whenever we attempt
to <u>execute the program</u> // no final executable file is produced   1

The interpreter must interpret and execute each statement every time
the program is run   1

The program will <u>execute slower</u> (compared to compiled code)   1   **[Max 1]**

6 (a) 1. The (contents of) the program counter/PC are copied to the <u>Memory Address Register</u>
Refuse 'instruction' stated as 'the contents of'
2. The <u>contents of the Program Counter</u> are incremented
3. Identify the <u>address in the Memory Address Register</u>. Go to this
address and copy its <u>contents to the Memory Data Register</u>
4. The (contents of) the Memory Data Register are copied to the   **[4]**
<u>Current Instruction Register</u>

(b) (i) Control bus   **[1]**

(ii) read / write
interrupt
reset
Clock signal   **[Max 1]**
Bus request / bus grant

(c) (i) Case 2   1

The address in CIR must be loaded to the MAR / address
bus   1   **[Max 2]**
The data value must be retrieved from this address / address 78   1

(ii) Case 1   1

The operand is a register // the register is part of the CPU (i.e. not in
memory) // it is using only the Accumulator   1   **[Max 2]**
the address <u>bus</u> is not used // there is no call to memory   1

7 **(a)** `Mary Kelly` **[1]**

(b) `1X0X` **[1]**

(c) `Ajaz ew` **[1]**

(d) Error **[1]**

(e) `white box TESTING` **[1]**

(f) Built-in functions are those provided (as a part of the programming language) // accept by example   1

User defined functions are designed and coded by the programmer   1   **[2]**