CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the October/November 2015 series

9691 COMPUTING

9691/33 Paper 3 (Written Paper), maximum raw mark 90

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1 (a) The table has a repeated group of attributes //
There are several orders for the same customer/`CustomerID` [1]

(b) (i) `CUSTOMER(CustomerID, ……..)`
`PRODUCT(ProductID)` [1]

`ORDER(CustomerID, OrderDate,……..)` [1]

(ii)

[2]

1 mark for each correct one-to-many relationship

(iii) Primary key //`CustomerID` in the `Customer` table [1]
Links to foreign key (`CustomerID`) in the `ORDER` table [1]

(c)
```
SELECT ProductID                                          [1]
FROM PRODUCT                                              [1]
WHERE RetailPrice>=100 AND RetailPrice<=200               [1]
```

(d)

Creates a new record in the `ORDER` table	
Amends an existing record in the `ORDER` table	✓
Assigns the `Dispatched` attribute a `TRUE` value	✓
Creates a new attribute `Dispatched`	
Changes all the existing records for customer 647	
Changes one record for customer 647	✓

[1] [1] [1]

Remove 1 mark for each additional tick.

(e) (i)
```
INSERT INTO ORDER                                         1
(CustomerID, OrderDate, ProductID, Dispatched,
DispatchDate)                                             1
VALUES (447, #17-10-15#, 982, FALSE, (NULL))              1   [3]
```

(ii) Attempt to add a record in `ORDER` table 1
But, no corresponding `ProductID` in the `PRODUCT` table 1
Or:
// Delete a record in the `PRODUCT` table 1
and, matching records in `ORDER` table remain 1 [2]
Or: Similar explanation with `ORDER` and `CUSTOMER` and the `CustomerID` attribute // Allow use of the term 'update' if mentions a change to `TutorID`/foreign key attribute

2 (a) (i) Building a model of the system // Models the behaviour of the system 1
The model records over time the result of changing parameters/conditions/ circumstances // predicts outcomes for the real-world scenario 1 [2]

(ii) A computer program can be written to build the model 1
The computer system can process results very quickly // can change the time frame // Can process large volumes of data 1
Use of the computer avoids possible health and safety issues 1 [max 1]

(b) Temperature sensor 1
Air pressure sensor 1
Moisture sensor 1 [max 2]

(c) Wind tunnel requires that an actual physical model is built 1
The modelling of the weather is only an abstraction realised by the computer software 1 [2]

3 (a) (i) 0101 1000 1
0111 1101 1 [2]

(ii) 16 [1]

(b) (i) Action
Description
`MAR ← [PC]`
The contents of the Program Counter are copied to the Memory Address register [1]

`PC ← [PC] + 1`
The contents of the Program Counter are incremented [1]

`MDR ←[[MAR]]`
The contents of the address currently in the Memory Address Register are copied to the Memory Data Register [1]

`CIR ← [MDR]`
The contents of the Memory Data Register are copied to the Current Instruction Register [1]

(ii)

Fetch stage	Special purpose registers (Contents shown in hex)				Buses	
	PC	MAR	MDR	CIR	Address bus	Data bus
	58					
MAR ← [PC]		58			✓	
PC ← [PC] + 1	59					
MDR ←[[MAR]]			867A			✓
CIR ← [MDR]				867A		

[max 5]

4 (a)

	Register	
Instruction	**ACC**	**Index Register (IX)**
LIX 400		3
LDD 401	616	
LDI 401	96	
LDX 401	63	

[1]

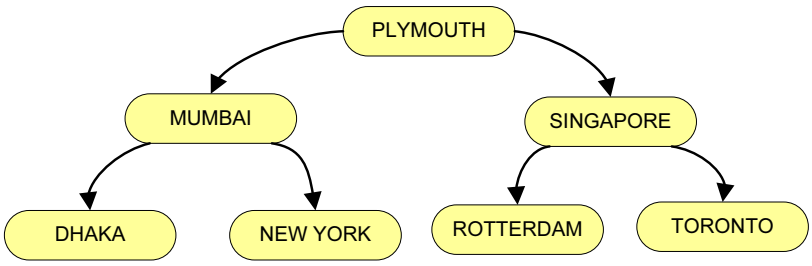
[1]

[1]

[1]

(b) **Use the text editor to write the assembly language program**
PROG.ASM 1
REPEAT
PROG.ASM is input to the assembler software 1
IF errors reported
THEN
Amend PROG.ASM using the text editor 1
ENDIF
UNTIL No errors reported
Produce the PROG.EXE executable file 1
Run PROG.EXE 1 [max 4]

5 **(a)** **(i)**



Root correct 1
Left subtree correct 1
Right subtree correct 1 [3]

(ii) *Labelling ....*
Root [1]
Left subtree // FT for their tree [1]

(iii) 4 // FT for their tree [1]

(b) **(i)**
```
INTEGER
ARRAY[1 : 2000] OF STRING
```
[2]

(ii)

RootPtr	1					
1	3			LIMA		2
2	4			PARIS		5
3	6			KARACHI		0
4	0			MELBOURNE		0
5	0			WARSAW		0
6	0			CAPE TOWN		7
7	0			EDINBURGH		0

[4]

(c)
```
//binary tree search
INPUT SearchCity                                                    [1]
IsFound ← FALSE
Current ← RootPtr
REPEAT
   IF City[Current] = SearchCity                                    [1]
      THEN
         //found
         OUTPUT "Found"
         IsFound ← TRUE                                             [1]
      ELSE
         IF SearchCity > City[Current]
            THEN
               // move right
               Current ← RightPtr[Current]                          [1]
            ELSE
               Current ← LeftPtr[Current]
         ENDIF
      ENDIF
UNTIL Current = 0 OR IsFound = TRUE                                 [1]

IF IsFound = FALSE                                                  [1]
   THEN
      OUTPUT SearchCity "Not Found"
ENDIF
```

6 (a) (i) `SumRange` 1
`ThisInteger1, ThisInteger2, Flag` 1
Must be identifiers only … [2]

(ii) 6 [1]

(iii) ERROR [1]

(iv) ERROR [1]

(v) 11 [1]

(vi) ERROR [1]

7 **(a)** More than one program loaded into memory at the same time [1]

(b) Anything reasonable …
printer drivers
spooler
linker
loader
compiler / assembler
backup software

R. "System software" and "Utilities" [max 2]

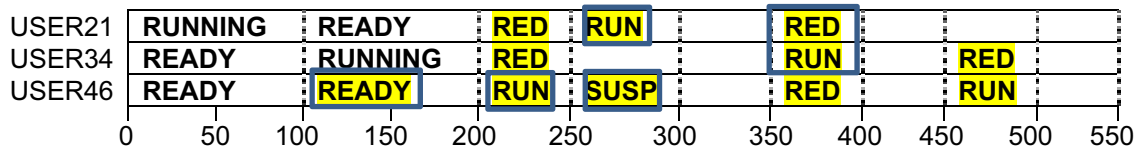
(c)

All the (data) is processed together/at the same time	1	
There is a time delay before processing	1	
Output is generated as a batch	1	
Processing cannot start until all data has been collected/input	1	
There is no user involvement // the process runs until completion	1	[max 3]

(d) **(i)**

Each program can use the processor in turn	1	
For a time of 100 milliseconds // for the fixed time slice	1	[2]

(ii)



1 mark each [5]

(iii) Input/output request [1]

8 **(a)** *The diagram includes the following*
One or more communication links to ….

A modem // router	1	
Firewall	1	
Laser printer	1	
File server // database server	1	[max 4]

Penalise once only the omission of a comms. link line

(b) Twisted pair 1
Description 1
Or …
Coaxial cable 1
Description 1
Or …
Optical fibre 1
Description 1

Allow descriptors CAT 5, CAT 6 [max 2]