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

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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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)
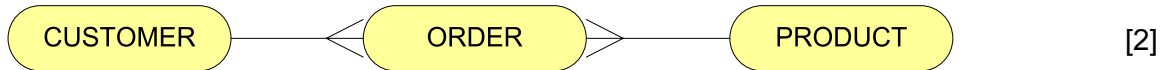
1 mark for each correct one-to-many relationship [2]

(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	✓	[1]
Assigns the Dispatched attribute a TRUE value	✓	[1]
Creates a new attribute Dispatched		
Changes all the existing records for customer 647		
Changes one record for customer 647	✓	[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 <u>program</u> 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]
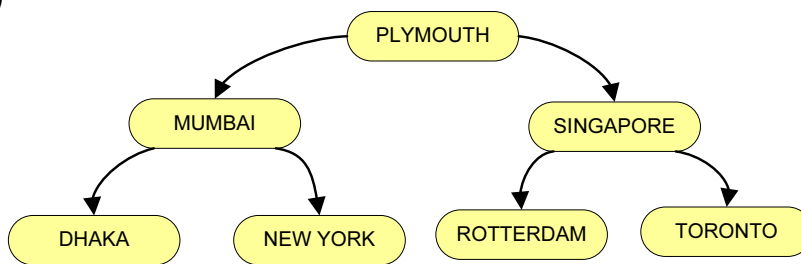
[1]

[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]

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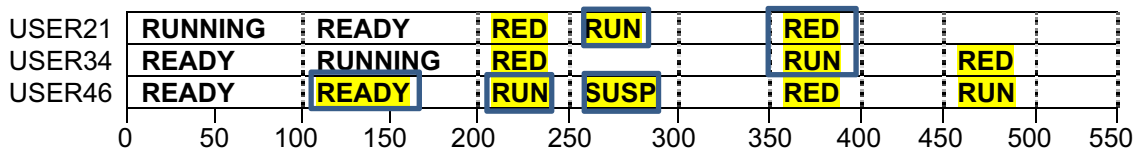**7** **(a)** More than one program loaded into memory at the same time [1]

(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)

USER21	**RUNNING**	**READY**	**RED**	**RUN**		**RED**		
USER34	**READY**	**RUNNING**	**RED**		**RUN**		**RED**	
USER46	**READY**	**READY**	**RUN**	**SUSP**		**RED**	**RUN**	

```
0    50   100   150   200   250   300   350   400   450   500   550
```

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]