

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

Cambridge International Advanced Level

## **MARK SCHEME for the October/November 2015 series**

### **9691 COMPUTING**

**9691/31**

Paper 3 (Written Paper), maximum raw mark 90

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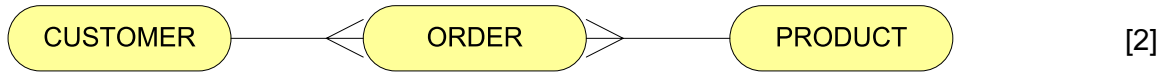
Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9691	31

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

(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, 1  
 DispatchDate) 1  
 VALUES (447, #17-10-15#, 982, FALSE, (NULL)) 1 [3]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9691	31

	(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)

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

[1]

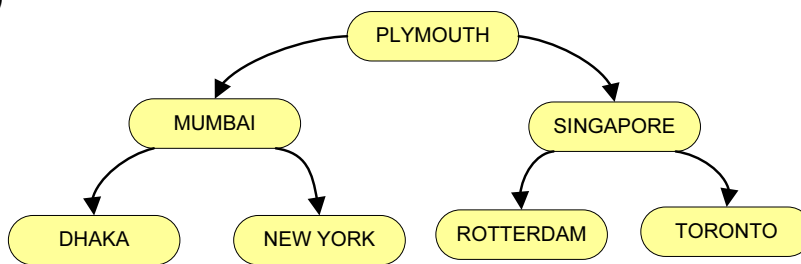
[1]

[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 [2]  
 ARRAY[1 : 2000] OF STRING

(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]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9691	31

```

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

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9691	31

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

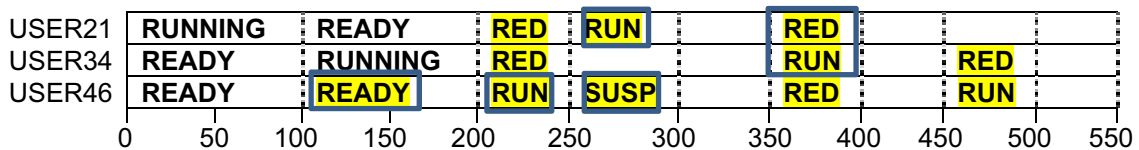
- (b) Anything reasonable ...  
 printer drivers  
 spooler  
 linker  
 loader  
 compiler / assembler  
 backup software

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

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge International A Level – October/November 2015	9691	31

(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]