

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**GCE Advanced Level**

## **MARK SCHEME for the May/June 2014 series**

### **9691 COMPUTING**

**9691/31**

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.

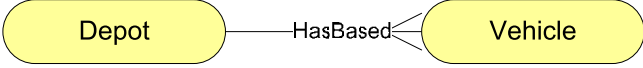
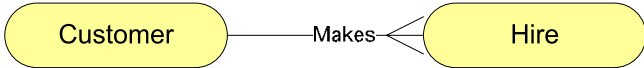
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- 1 (a) The rule is defined in terms of itself  
 A. 'calls' itself  
 Rule 4 [2]
- (b) (i)  $\langle \text{LeftBr} \rangle \langle \text{Digit} \rangle \langle \text{RightBr} \rangle // 8$  is a  $\langle \text{digit} \rangle$  (1)  
 But a  $\langle \text{Digit} \rangle$  is an  $\langle \text{Integer} \rangle$  (1)  
 So final expression is:  
 $\langle \text{LeftBr} \rangle \langle \text{Integer} \rangle \langle \text{RightBr} \rangle$  (1) [3]
- (ii)  $\langle \text{ArraySubscript} \rangle$  must end with  $\langle \text{RightBr} \rangle$  [1]
- (c)  $\langle \text{ZeroDigit} \rangle ::= 0$  (1)  
 $\langle \text{NonZeroDigit} \rangle ::= 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$  (1)  
 $\langle \text{Digit} \rangle ::= 0 \mid 1 \mid 2 \mid 3 \mid 4 \mid 5 \mid 6 \mid 7 \mid 8 \mid 9$  (1)
- 2 marks MAX – for discriminating between original digits and non-zero
- $\langle \text{Digit} \rangle ::= \langle \text{ZeroDigit} \rangle \mid \langle \text{NonZeroDigit} \rangle$  (1)  
 $\langle \text{Index} \rangle ::= \langle \text{NonZeroDigit} \rangle \mid \langle \text{Index} \rangle \langle \text{Digit} \rangle$  (1)  
 $\langle \text{ArraySubscript} \rangle ::= \langle \text{LeftBr} \rangle \langle \text{Index} \rangle \langle \text{RightBr} \rangle$  (1) [MAX 4]

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- 2 (a) The table is not in First Normal Form (1)  
The table has a repeated group of attributes/Registration and VehicleType is repeated (for each depot) (1) [2]
- (b) (i)  (1)
- (ii) Vehicle (RegistrationNo, VehicleType, Mileage, DepotTown)  
Mark as follows ...  
Correct first three attributes (1)  
RegistrationNo PK (1)  
DepotTown present (1)
- Depot (DepotTown (or similar), DepotAddress)  
All correct ... (1) [4]
- (c) (i)  (1)
- (ii) Primary key CustomerID in the Customer table (1)  
links to foreign key (CustomerID or by implication) in the Hire table (1) [2]
- (d) Displays the registration number (1)  
For all vehicles currently on a hireout (1) [2]
- (e) SELECT DepotTown, RegistrationNo (/ or equivalent) (1)  
FROM Vehicle (R. 'DepotVehicle') (1)  
WHERE VehicleType (/ or equivalent) = 'SC' (1) [3]
- (f) UPDATE Hire  
SET LicenceChecked = TRUE // "YES" // equivalent (1)  
A. Any sensible attribute name + value  
WHERE CustomerID = '085' AND  
StartDate = #13/07/2014#  
// DateBooked = #05/04/2014# (1) [2]

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- 3 (a) (i)** X = 15 [1]
- (ii)** Age = 12 [1]
- (iii)** Who = moira  
Who = imram  
Who = jajid  
Who = sarah  
Who = sajid
- NB Names only ...  
A. wrong case .... [1]
- (iv)** False // No // Invalid [1]
- (b)**
- |                              |     |
|------------------------------|-----|
| team(seniorFemale).          | (1) |
| teamGender(seniorFemale, f). | (1) |
| ageLimit(seniorFemale, 99)   | (1) |
| player(azhar, f, 24).        | (1) |
| player(asmara, f, 31).       | (1) |
- Penalty –1 for wrong case used for either data or clause names [MAX 4]
- (c) (i)** Checks that the player has a gender which matches the requirement for the stated team [1]
- (ii)**  $\text{ageLimit}(\text{TeamY}, \text{AgeY})$  and  $\text{AgeX} \leq \text{AgeY} // \text{AgeX} < \text{AgeY}$   
1 1 1
- (or description for 1 only) There must be a check on the age limit [3]

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- 4 (a) (i) BEAR - CATERPILLAR [1]  
(ii) 3 leaf nodes [1]

- (b) INTEGER (1)  
ARRAY[1 : 2000] ... (1)  
(OF) STRING / TEXT (1) [3]

(c)

RootPtr	1
---------	---

	LeftPtr	Data	RightPtr
1	4	ELEPHANT	2
2	5	LLAMA	3
3	(0)	SNAKE	7
4	(0)	BEAR	6
5	(0)	LION	(0)
6	(0)	CATERPILLAR	(0)
7	(0)	TIGER	0

*Mark as follows:*

- Root = 1 (1)  
Elephant pointers 4 and 2 (1)  
Six names entered (1)  
Other pointers correct (1) [4]

- (d) (i) 3 [1]

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(ii)

```

//binary tree search
INPUT SearchAnimal
IsFound ← FALSE
Current ← RootPtr
REPEAT
  IF SearchAnimal = Data[Current]
  THEN
    //found
    OUTPUT 'Found'
    IsFound ← TRUE
  ELSE
    IF SearchAnimal > Data[Current]
    THEN
      // move right
      Current ← RightPtr[Current] (A.=)
    ELSE
      Current ← LeftPtr[Current]
    ENDIF
  ENDIF
UNTIL IsFound( = TRUE)
      // SearchAnimal = Data[Current]
      OR Current = 0

IF Current = 0
  // IsFound = FALSE // NOT IsFound
  // IsFound = FALSE AND Current = 0
  THEN
    OUTPUT SearchAnimal ' Not Foundv
  ENDIF

```

[5]

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- 5 (a) 97 (1)  
-116 (1) [2]
- (b) 61 97  
1 mark per byte [2]
- (c) 6A F5  
1 mark per byte [2]
- (d) (i) +6.5 give 3 marks  
*If answer incorrect mark as follows:*  
Exponent: +3 // move the pattern three places  
Mantissa: +13/16 // 0.1101  
Answer:  $13/16 \times 2^3$  // or equivalent [3]
- (ii) (*Positive ...*) The mantissa/byte 7 starts with a zero [1]
- (e) (i) (*Normalised ...*) The mantissa/byte 7 starts with 01 / the first two bits are different [1]
- (ii)
- |                               |                               |
|-------------------------------|-------------------------------|
| Mantissa                      | Exponent                      |
| 0   1   1   0   0   0   0   0 | 0   0   0   0   1   0   1   0 |
| Mantissa                      | Exponent                      |
| 1   0   0   0   1   1   0   0 | 0   0   1   1   0   0   0   1 |
- [MAX 3]**
- (f) The precision/accuracy is increased, but ...  
The range of possible numbers is decreased [2]

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- 6 (a) A number of computers which are connected ... (1)  
Over a small 'geographical' area / or by example – site / building (1)  
A. over a short distance [2]
- (b) (i) Use of (user IDs with a) password  
Use of biometrics / fingerprint / retina scanner [1]
- (ii) domain controller // file server to authenticate log-ons  
fingerprint/retina scanner  
A. firewall [1]
- (c) *Possible benefits*
- Optic fibre:
- data travels at the speed of light / provides for faster data transfer
  - not affected by moisture / (electro-magnetic) interference
  - impossible for the data to be hacked
  - high bandwidth possible
- Twisted pair:
- less chance of interference from magnetic forces in close proximity
  - low cost
  - easy to work with // flexible
- Coaxial:
- difficult for the data to be hacked into
  - screened to avoid (electro-magnetic) interference
- Mark as: 2 × 3 marks per type* [6]
- (d) Router [1]
- (e) Firewall // proxy server [1]
- (f) *Hardware ...*  
Large amount of hard-disk storage  
Database server
- Software ...*  
Database Management Software (A. DBMS)  
R. database
- Computers must have some form of 'client software' to access the database //  
Software must be specially written to access the DBMS // A. 'browser' if  
followed by some form of explanation [Max 3]



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- 7 (a) a model / program (A. software) of the real-world system is produced  
 (real-world system can be given by example) (1)  
 DO NOT accept 'imitate' instead of model.
- to predict the likely behaviour (of a real-world system) (1) [2]
- (b) (Air) pressure sensor  
 Wind speed / air flow sensor  
 Humidity / moisture sensor [MAX 2]
- (c) The flight simulator is a physical entity // by example e.g. actuators //  
 specialist hardware will be needed  
 Weather forecasting has to produce results faster than real-time // flight  
 simulator operates in real-time  
 Flight simulator requires continual user input to operate [1]