CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level

MARK SCHEME for the May/June 2014 series

9691 COMPUTING

9691/32 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.
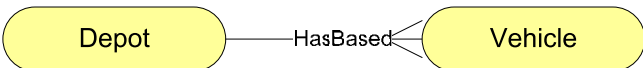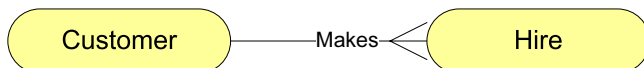
Cambridge will not enter into discussions about these mark schemes.

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CAMBRIDGE
International Examinations

1 (a) The rule is defined in terms of itself
A. 'calls' itself
Rule 4

[2]

(b) (i) `<LeftBr> <Digit> <RightBr>` // 8 is a `<digit>` (1)
But a `<Digit>` is an `<Integer>` (1)
So final expression is:
`<LeftBr><Integer><RightBr>` (1) **[3]**

(ii) `<ArraySubscript>` must end with `<RightBr>` **[1]**

(c) `<ZeroDigit> ::= 0` (1)

`<NonZeroDigit> ::= 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9` (1)

`<Digit> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9` (1)

2 marks MAX – for discriminating between original digits and non-zero

`<Digit> ::= <ZeroDigit> | <NonZeroDigit>` (1)

`<Index> ::= <NonZeroDigit> | <Index><Digit>` (1)

`<ArraySubscript ::= <LeftBr><Index><RightBr>` (1) **[MAX 4]**

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)

Depot — HasBased — Vehicle

[1]

(ii) `Vehicle (`<u>`RegistrationNo`</u>`, VehicleType, Mileage,`
`                                    DepotTown)`

Mark as follows ...
Correct first three attributes (1)
<u>`RegistrationNo`</u> PK (1)
`DepotTown` **present** (1)

`Depot (`<u>`DepotTown`</u> (or similar)`, DepotAddress)`
All correct … (1) **[4]**

(c) (i)

Customer — Makes — Hire

[1]

(ii) <u>Primary key</u> `CustomerID` in the <u>`Customer`</u> 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]**

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(asmar, 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) <u>`ageLimit(TeamY, AgeY)`</u> `and AgeX <= AgeY // AgeX < AgeY`
                        1   1   1
  (or description for 1 only) There must be a check on the age limit   **[3]**

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]**

(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]

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 <u>mantissa/byte 7</u> starts with a zero   **[1]**

   (e) **(i)**   *(Normalised …)* The <u>mantissa/byte 7</u> 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]**

6 (a) A number of computers which are <u>connected</u> ... (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]**

7 **(a)** a <u>model / program</u> (A. software) of the <u>real-world</u> system is produced
(real-world system can be given by example)   (1)
DO NOT accept 'imitate' instead of model.

to predict the likely <u>behaviour</u> (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 <u>physical</u> entity // <u>by example e.g. actuators</u> //
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]**