

CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Level

MARK SCHEME for the October/November 2013 series

9691 COMPUTING

9691/32

Paper 3 (Written Paper), maximum raw mark 90

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- 1 (a) (i) $x y - 5 /$ [1]
- (ii) $2 \frac{4 a * 1 +}{1} /$ [1]
 2nd mark for completely correct [1]
- (b) Evidence for 12 or 6 [1]
 Answer 2 [1]
- (c) (i) In-order traversal // (traverse each subtree in) the order left-root-right [1]
- (ii) $1 2 / b * h *$ [1]
- (iii) Post(-order) traversal // (Traverse/visit each subtree in) the order left-right-root [1]
- [Total: 8]**

- 2 (a) Security is improved/better managed [1]
 Different users can have different 'views' of/access to data [1]
 Program-data independence [1]
 // Changing a field does not require an applications program re-write [1]
 Queries and reports quickly produced [1]
 Reduced data duplication/ repetition /redundancy [1]
 Reduced data inconsistencies [1]
 Better managed /or similar data integrity/data validation // Validation code does not need to
 be present in all applications programs [1]
 If implemented with a DBMS it will allow concurrent access to the database [1]
MAX 3

- (b) (i) Many product can be supplied by one supplier // many-to-one // M:1 [1]
- (ii) Many products appear on many orders // many-to-many // M:M [1]

- (c) (i)
- ```

 erDiagram
 PRODUCT ||--}| ORDER-PRODUCTS
 ORDER-PRODUCTS ||--}| ORDER

```
- Intermediate table (not labelled PRODUCT, ORDER, etc.) [1]  
 2 X one-to-many relationship [1]
- (ii) Primary key of PRODUCT/Primary key ProductID // Primary key of ORDER [1]  
 Is used as a foreign key in the link table [1]

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- (d) (i) (Yes) since there is a not a repeated group of attributes [1]
- (ii) (Yes) since there is only a single attribute primary key  
 // there are no partial dependencies  
 // all non-key attr. are dependent on the primary key [1]
- (iii) There are dependent non-key attributes //  
SupplierName and/or SupplierTelNo are dependent on SupplierID [1]
- (iv) PRODUCT(ProductID, ProductDescription, RetailPrice, SupplierID) [1]  
 SUPPLIER(SupplierID, SupplierName, SupplierTelNumber) [1]
- If primary key not-indicated penalise once only

- (e) Avoids data duplication/avoids repeated data // reduces data redundancy [1]  
 Avoids data inconsistencies [1]  
 Ensures data integrity [1]  
 MAX 2

- (f) SELECT CustomerID, OrderNo [1]  
 FROM ORDER [1]  
 WHERE OrderDate = #15/01/2014# AND PaymentMethod = 'D'  
 (AND ISPaid = TRUE) [1]

Do not penalise imprecise syntax in the WHERE line

[Total: 19]

- 3 (a) Temporary storage location [1]  
 general purpose/special (purpose) [1]  
 Inside the (micro)processor [1]  
 MAX 2
- (b) (i) 3C [1]
- (ii) 271 [1]
- (iii) Fewer digits used to represent any number // long string difficult to interpret [1]  
 Less likely to make a mistake when copying/converting a digit string [1]  
 Easy to convert from binary to hex (vice versa) than binary to denary [1]  
 MAX 1
- R. Hex is easier to understand/write

(c) (i) 2 bytes [1]

(ii) The Program Counter contains 30 [1]

MAR ← [PC] // MAR given the contents of the PC [1]

PC ← [PC] + 1 // PC is incremented [1]

MDR ← [[MAR]] // The contents of the address in MAR is copied to MDR [1]

CIR ← [MDR] // The contents of MDR are copied to CIR [1]

*OR ... If the candidate's answer uses the suggested instruction:*

The Program Counter contains 30 [1]

PC contents are copied to MAR [1]

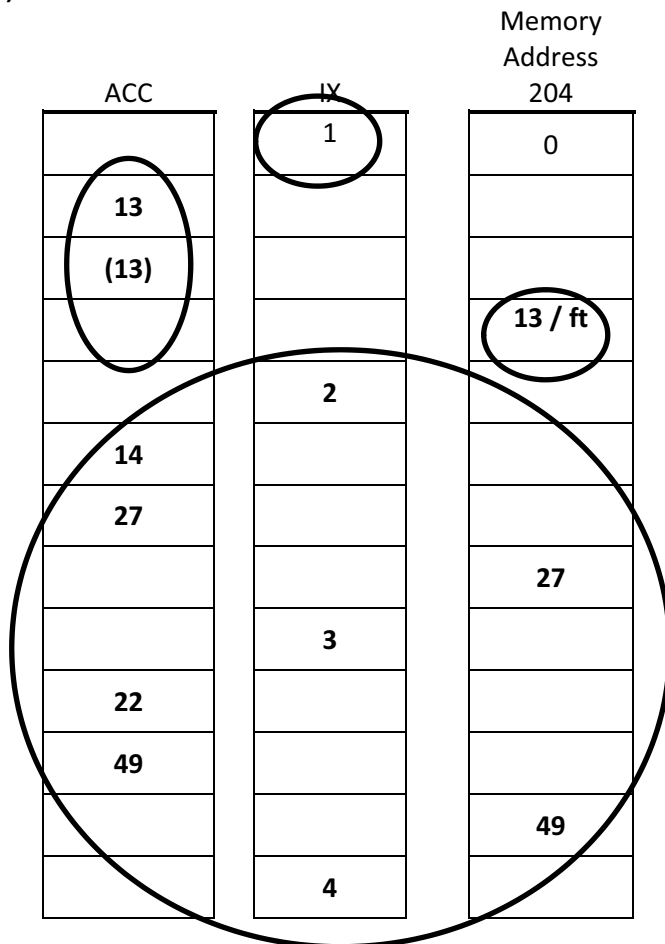
PC contents are incremented to 31 [1]

The contents of address 30 / 2150 is copied to MDR [1]

MDR contents / 2150 is copied to CIR [1]

MAX 5

(d)



[4]

[Total: 15]

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- 4 (a) A class is the design/blueprint/template (from which objects are later created) [1]  
A class consists of properties/attributes and methods/procedures/functions [1]

An object is an instance of a class [1]  
An object must be based on a class definition [1]  
Many objects can exist for the same class [1]

MAX 3

- (b) The class diagram includes:

ADMIN + PROJECTSTAFF subclasses of EMPLOYEE [1]

PROGRAMMER + TECHAUTHOR subclasses of PROJECTSTAFF [1]

Recognised notation for inheritance [1]

EMPLOYEE class FullTimeIndicator : BOOLEAN // CHAR [1]

Salary(Grade) : any except DATE/BOOLEAN [1]

ADMIN class Department : STRING [1]

PROJECTSTAFF class ProjectTeam : STRING [1]

PROGRAMMER class ProgrammingLanguage : STRING [1]

TECHAUTHOR class SoftwareSpecialism : STRING [1]

NB: check for any attribute repeated in a child class. If present score 0.

MAX 8

- (c) *Encapsulation*

Combining together of an object's properties/data and the methods [1]

Restricts the programmer's access to the object's data // provides for 'data hiding' [1]

Data values can only be read/written using the methods of the class [1]

MAX 2

[Total: 13]

5 (a) Boolean [1]  
 Flags when the input name is found [1]

```
//Serial search algorithm
INPUT SearchName [1]
IsFound ← FALSE
Index ← 1

REPEAT
 IF Customer[Index] = SearchName Allow '(' and ')' [1]
 THEN
 IsFound ← TRUE
 OUTPUT "FOUND" at position Index
 ELSE
 Index ← Index + 1 [1]
 ENDIF
UNTIL (IsFound = TRUE) OR Index=101 / >100 [1]

IF IsFound = FALSE // Index = 101/>100 [1]
 THEN
 OUTPUT "Customer name was NOT FOUND"
 ENDIF
```

(b) 50 // half the number of customers [1]

(c) (i) Items in order [1]

(ii) The function makes a call to itself (in two places) [1]

(iii) BinarySearch (Surname, "Hwang", 1, 11)

| Low | High | Middle | RETURNS ... |
|-----|------|--------|-------------|
| 1   | 11   | 6      |             |
| (1) | 5    | 3      |             |
| 4   | (5)  | 4      | 4           |
|     |      |        |             |

[4]

[Total: 14]

|               |                                            |                 |              |
|---------------|--------------------------------------------|-----------------|--------------|
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6 (a)

|      |   |   |   |   |   |   |   |   |   |
|------|---|---|---|---|---|---|---|---|---|
| -126 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |   |
| -5   | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | + |
|      | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 1 |   |
| 1    |   |   |   |   |   |   |   |   | 1 |

Mark as follows ...

-126 binary [1]

-5 binary [1]

Correct final pattern (f/t from their -126 and -5) [1]

Answer is incorrect since outside range possible represented with single byte // answer overflows// final bit pattern is NOT -131 [1]

(b) (i) Mantissa: +13/16 [1]  
 Exponent: +3 [1]  
 Number: +13/16 × 2<sup>+3</sup> // evidence of shifting the mantissa three places [1]  
 6.5 [1]  
 MAX 3

(ii) The mantissa starts with the digits 01 [1]  
 // the first two bits in the mantissa are different [1]

(iii) More bits used for the mantissa will result in greater accuracy/precision [1]  
 More bits used for the exponent will result in larger range of numbers [1]

**[Total: 10]**

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7 Possible answers include:

- (a) Encryption of email traffic [1]  
 Email data if intercepted cannot be read [1]
- Encryption of passwords // logging-in to “something” [1]  
 Designed to prevent unauthorised access [1]
- Hospital patient records [1]  
 Will safeguard the privacy/confidentially of data [1]
- (b) *Plain text*  
 The (message) text/data/ before encryption // unaltered text/original text [1]  
*Cipher text*  
 The (message) text after encryption [1]
- (c) *Symmetric encryption*  
 The plain text /data is encrypted using ... [1]  
 An encryption key [1]  
 Decryption is done using the same/ or by implication key ..... [1]  
 and a matching decryption algorithm/process [1]  
 MAX 3
- (d) *Authorisation*  
 Different permissions granted to different users [1]  
 Restricted access to certain data files/directories/physical devices [1]  
 User IDs [1]  
 MAX 1
- Authentication*  
 Passwords [1]  
 (Digital) signature // (Digital) certificate [1]  
 Use of biometric data and methods [1]  
 MAX 1
- [Total: 11]