OCR RECOGNISING ACHIEVEMENT

ADVANCED GCE

COMPUTING

Systems Software Mechanisms, Machine Architecture,
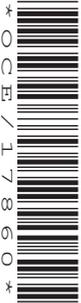Database Theory and Programming Paradigms

2509

Candidates answer on the Question Paper

OCR Supplied Materials:
None

Other Materials Required:
None

**Monday 14 June 2010
Afternoon**

Duration: 1 hour 30 minutes

Candidate Forename		Candidate Surname	

Centre Number						Candidate Number				

INSTRUCTIONS TO CANDIDATES

* Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
* Use black ink. Pencil may be used for graphs and diagrams only.
* Read each question carefully and make sure that you know what you have to do before starting your answer.
* Answer **all** the questions.
* Do **not** write in the bar codes.
* Write your answer to each question in the space provided.
* Additional answer space is available on the lined pages at the back of this booklet. Answers on these pages **must** be clearly numbered.

INFORMATION FOR CANDIDATES

* The number of marks is given in brackets **[ ]** at the end of each question or part question.
* The total number of marks for this paper is **90** of which 4 marks are allocated to the assessment of the quality of written communication.
* No marks will be awarded for using brand names of software packages or hardware.
* This document consists of **20** pages. Any blank pages are indicated.

Examiner's Use Only:		
1		12
2		10
3		12
4		12
5		12
6		6
7		7
8		15
QWC		4
Total		**90**

OCR is an exempt Charity   **Turn over**

Answer **all** questions.

1 **(a)** One feature of an operating system is memory management.
Give **four** functions of memory management.

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.... **[4]**

(b) For a multi-user operating system, describe **one** method of scheduling, and explain its purpose.

Method ....

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Purpose ....

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.... **[4]**

 (c) Describe the file allocation table (FAT) and how it is used in a typical personal computer (PC)
 operating system.

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 .... **[4]**

Turn over

2 **(a)** Use ticks to complete the table to show at which stage of compilation, if any, each task would be done.

	Not done during compilation	Lexical analysis	Syntax analysis	Code generation
Statements are checked against the rules of the language				
Source program is used as input				
All variables are given addresses				
Optimisation occurs				
Variable names are put into a symbol table				
Comments are removed				
Logical errors are found and reported				
Relative addresses are calculated				

[8]

(b) Tokens are used during compilation.
Give the meaning of the term token and state how tokens are used.

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.... [2]

3 **(a)** Describe the purpose of the memory data register (MDR).

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.... **[3]**

(b) Interrupts are given priorities.

   (i) Explain the term interrupt.

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.... **[2]**

   (ii) Explain why priorities are needed for interrupts.

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(c) At a particular stage in a program, the counter holds the equivalent of the value 135. Instead of changing to 136, its next value is 24. No interrupt has occurred. (Numbers are given in denary to help you.)

Explain what is happening in the program.

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.... **[2]**

(d) State **two** mains features of Von Neumann architecture.

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.... **[2]**

4 (a) A sequential file contains the following data:
Belfast, Cardiff, Glasgow, London, Oxford, Newcastle, York

   (i) Explain the stages of a serial search for 'Hull' in the file.

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   .... **[3]**

   (ii) Explain the stages of a binary search for 'Newcastle'.

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   .... **[3]**

(b) (i) Explain **one** advantage of a binary search compared with a serial search when used for searching a sequential file containing a large number of items of data.

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.... **[2]**

   (ii) State **one disadvantage** of a binary search compared with a serial search when used for searching any file.

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.... **[1]**

(c) Show the stages of an insertion sort to put the numbers in ascending numerical order. The routine has been started for you.

Instruction   Numbers

	16	(2)	7	3	21	14
Insert 2	2	16	(7)	3	21	14
Insert 7	2	7	16	3	21	14

[3]

Turn over

5 (a) State **three** characteristics of a low level language.

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.... **[3]**

(b) (i) A particular low level language uses the instruction ADD 45 to mean 'add the number in address 45 to the number in the accumulator'. Name this type of addressing.

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.... **[1]**

(ii) Another instruction ADN 67 means 'add the number 67 to the number in the accumulator'. Name this type of addressing.

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.... **[1]**

(iii) Explain the purpose of the accumulator.

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.... **[2]**

(c) In BNF (Backus-Naur form), the following definitions are given:

        <digit> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

        <sign> ::= + | –

Using these definitions, write definitions for

(i) sum, where sum is any two digits separated by + or – (e.g. 3 + 4 or 5 – 2)

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    .... **[1]**

(ii) small number, where small number has one or two digits only (e.g. 2 or 30)

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    .... **[1]**

(iii) signed number, where signed number starts with one + or – sign, then has one or more digits (e.g. +3 or –45 or +0005)

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    .... **[3]**

Turn over

6 Data at a dental surgery is stored in a relational database. Part of the data model is shown.

| Patient | Attends | Appointment | Has | Dentist | WorksWith | Nurse |

Patient (PatientId, Surname, …)
Dentist (DentistCode, Surname, …)
Appointment (Date, Time, DentistCode, PatientId, …)

(a) Explain why the diagram has different symbols for Attends and WorksWith.

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.... **[2]**

(b) (i) State the meaning of the term primary key.

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.... **[1]**

(ii) Give **one** example of a primary key from this database.

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.... **[1]**

(c) Explain why PatientId is stored in the Appointment entity.

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.... **[2]**

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7 An estate agency sells properties including houses and flats. Details of properties for sale are stored using an object oriented language. Part of the class diagram is shown.

```
+---------------------+
|      Property       |
+---------------------+
|      price          |
|      propertyld     |
|      address        |
+---------------------+
|      storePrice:     |
|                     |
|                     |
|                     |
+---------------------+
          △
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          |
+---------------------+
|      Flat           |
+---------------------+
|      floorNumber    |
+---------------------+
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+---------------------+
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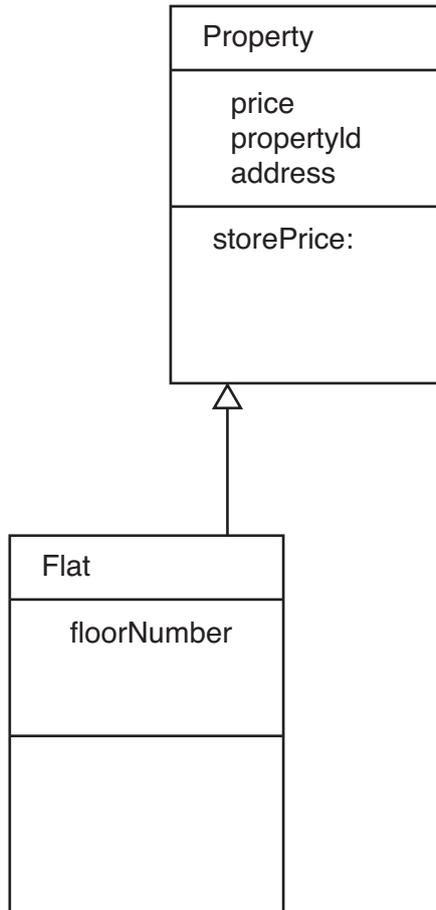
(a) Add House to the diagram, with a method called storeType: **[2]**

(b) Using examples from the diagram, explain the terms

   (i) attribute

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   .... **[2]**

(ii) inheritance

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.... **[3]**

PLEASE TURN OVER FOR THE LAST QUESTION

Turn over

8 (a) Describe **two** problems associated with flat files that may be avoided by using a relational database.

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.... **[4]**

(b) In a relational database

(i) state **two** tasks performed using a data definition language (DDL),

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.... **[2]**

(ii) explain the term data manipulation language (DML),

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.... **[2]**

(iii) give **two** examples of information stored in the data dictionary.

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.... **[2]**

(c) A database is used on a local area network in the finance department of a large company.

(i) Explain why users may be given different access rights to data.

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.... **[2]**

(ii) Describe a view of data that could be used by the staff in the finance department, and give a reason for your choice.

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.... **[3]**

If you use these lined pages to complete the answer to any question, the question number **must** be clearly shown.

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