

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

COMPUTING

2509

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

Tuesday **24 JANUARY 2006** Morning 1 hour 30 minutes

Candidate Name	Centre Number	Candidate Number											
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TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre Number and Candidate Number in the boxes above.
- Answer **all** the questions.
- Read each question carefully and make sure you know what you have to do before starting your answer.
- If you run out of space for an answer, continue on the spare pages at the back of the booklet.
- If you use these spare pages, you must write the question number next to your answer. You can also use these spare pages for rough work.

FOR EXAMINER'S USE		
Question No.	Max mark	Mark
1	13	
2	10	
3	6	
4	9	
5	10	
6	17	
7	14	
8	7	
WC	4	
TOTAL	90	

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 (86 + 4 written communication).
- You will be awarded marks for the quality of written communication where an answer requires a piece of extended writing.
- No marks will be awarded for using brand names of software packages or hardware.

This question paper consists of 12 printed pages, 2 lined pages and 2 blank pages.

1 (a) For any operating system,

(i) describe **one** method of scheduling and explain its purpose.

Description

.....

.....

.....

Purpose

.....

.....

.....[4]

(ii) state **two** ways in which segmentation and paging are similar.

Way 1.

.....

Way 2.

.....[2]

(iii) state **one** difference between segmentation and paging.

.....

.....[1]

(b) For a standalone personal computer (PC),

(i) describe the file allocation table (FAT).

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.....

.....[4]

(ii) describe the purpose of the boot file.

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.....[2]

2 (a) A program is written in a high-level language. After compilation a long list of errors is displayed.

Describe what would have happened if the same program had been interpreted.

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.....[4]

(b) Explain why a program is usually compiled before being offered for sale.

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.....[3]

(c) Describe the code generation phase of compilation, including the need for optimisation.

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.....[3]

3 In theory, both parallel processor systems and pipelining should increase processing speed.

(a) (i) Describe a parallel processor system.

.....

[2]

(ii) Complete the following table to show how pipelining is used.

fetch	decode	execute	
Instruction 1			1st cycle
			2nd cycle
			3rd cycle
			4th cycle

[2]

(b) Ignoring cost, state **one** disadvantage of

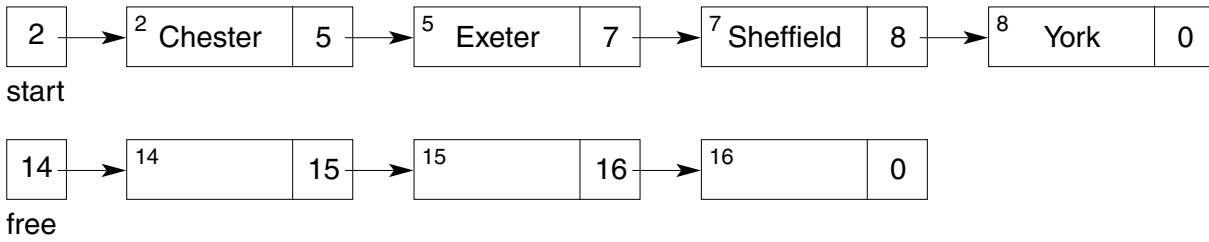
(i) a parallel processor system.

Disadvantage
[1]

(ii) pipelining.

Disadvantage
[1]

- 4 (a) The diagram shows a linked list that stores data about a number of cities in alphabetical order and a free list. In the space below, draw a new version of the diagram to show the linked lists after data about Lincoln is added.



[4]

- (b) (i) Give the stages of a binary search for the word 'daffodil' in the list

bluebell, crocus, daffodil, freesia, pansy, tulip, violet

.....

[3]

- (ii) Explain why, in general, a binary search is faster than a sequential search in a large set of data.

.....

[2]

5 (a) A high level language uses procedures and parameters.

Explain the term

(i) procedure.

.....
.....
.....
.....[2]

(ii) parameter.

.....
.....
.....
.....[2]

(b) Explain the difference between local and global variables.

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.....[2]

(c) Using examples, explain the difference between a class and an object in an object-oriented language.

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.....[4]

6 Information about students in a school is held in a relational database.

(a) Explain, with a suitable example, the term

(i) entity.

.....
.....
.....
.....[2]

(ii) attribute.

.....
.....
.....
.....[2]

(iii) primary key.

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.....
.....[2]

(b) The E-R diagram in Fig. 1 shows part of the school database.

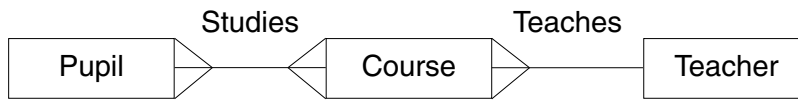


Fig. 1

(i) Explain the difference between the Studies and Teaches relationships.

.....
.....
.....
.....[2]

(ii) Draw a new version of Fig.1 after the database has been changed to third normal form.

[3]

(c) The entity life history diagram in Fig. 2 shows how data about a library book is used.

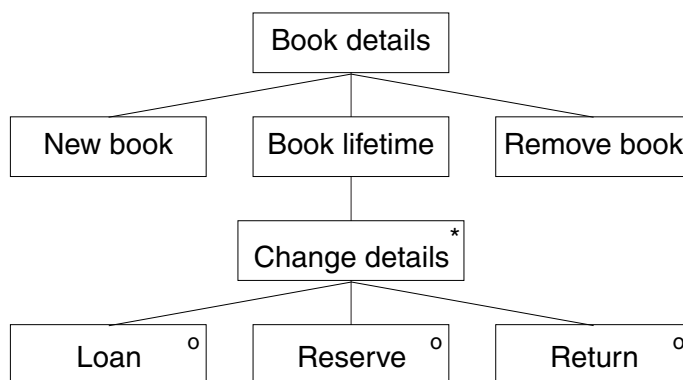


Fig. 2

Explain the meaning of the symbols.

(i) *

.....
.....[1]

(ii) °

.....
.....[1]

(d) In a database management system (DBMS), explain the term

(i) data description language (DDL).

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.....[2]

(ii) data manipulation language (DML).

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.....[2]

(v) State **one** advantage of a circular queue compared with the queue shown in Fig. 3.

.....
.....[1]

(b) A floating point binary number is represented using 4 bits for the mantissa followed by 4 bits for the exponent, each in two's complement binary form.

(i) Write the denary number 6 as a floating point binary number.

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.....
.....
.....[2]

(ii) Showing your working, write the floating point binary number 10010011 as its denary equivalent.

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.....[3]

8 (a) In the context of computer programming, state the meaning of the term *recursion*.

.....
.....
.....
.....[2]

(b) The following defines a function named THING.

THING (1) = 32

THING (n) = $\frac{1}{2}$ THING (n - 1)

Calculate the values of

(i) THING (2)

.....
.....[1]

(ii) THING (3)

.....
.....[1]

(iii) THING (6)

.....
.....[1]

(c) Name the type of recursion shown by the function THING in (b), giving a reason for your answer.

.....
.....
.....
.....[2]

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