

**ADVANCED GCE**  
**COMPUTING**  
Advanced Computing Theory

**F453**

Candidates answer on the question paper.

**OCR supplied materials:**

None

**Other materials required:**

None

**Thursday 23 June 2011**  
**Morning**

**Duration: 2 hours**



Candidate forename		Candidate surname	
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Centre number						Candidate number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Answer **all** the questions.
- Do **not** write in the bar codes.

**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 **120**.
- This document consists of **20** pages. Any blank pages are indicated.

1 This question is about a typical desktop PC (personal computer) operating system.

(a) (i) State when the boot file is used.

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..... [1]

(ii) State the purpose of the boot file.

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..... [1]

(b) Explain virtual memory.

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(c) Explain the purpose and use of the file allocation table (FAT).

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..... [6]

2 (a) Software is used to convert source code into object code.

(i) Name this type of software.

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 ..... [1]

(ii) Explain the term source code.

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 ..... [4]

(b) Complete the table with ticks to show at which stage, if any, events occur when a compiler is used.

	Lexical analysis	Syntax analysis	Code generation	Not during compilation
Optimisation occurs				
Logical errors are detected				
Tokens are created				
Spaces are removed				
Comments are removed				
Incorrect punctuation is detected				

[6]



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..... [8]

3 (a) Describe the effects of the fetch-execute cycle on the program counter (PC) and the memory address register (MAR).

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..... [5]

(b) (i) State **three** features of a Complex Instruction Set Computer (CISC) architecture.

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2. ....  
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3. ....  
..... [3]

(ii) Explain **one disadvantage**, other than cost, of a CISC architecture compared with a Reduced Instruction Set Computer (RISC) architecture.

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..... [2]

4 A real binary number may be represented in floating point binary notation using 4 bits for the mantissa and 4 bits for the exponent, both in two's complement binary. Numbers are normalised.

(a) (i) Convert 0110 0010 to denary.  
**Show all working.**

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..... [3]

(ii) Convert 1001 0001 to denary.  
**Show all working.**

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..... [3]

(b) Explain what happens when the denary number  $+5\frac{1}{4}$  (+5.25) is converted to a normalised floating point binary number in the format described.

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..... [4]



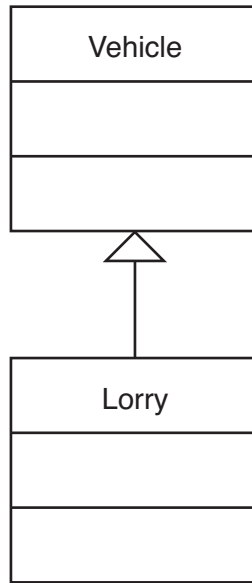


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**Turn over for next question**

- 6 (a) The Universal Modelling Language (UML) class diagram is used to show registered vehicles in this country. The diagram is incomplete.



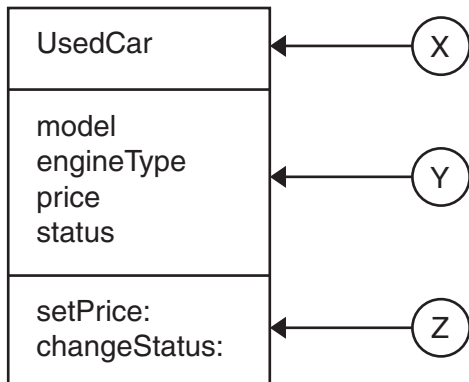
- (i) State where the classes Car and Moped should be added to the diagram, and give a reason for your answer. (You may draw on the diagram.)

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

- (ii) The registration numbers should be stored. State which class should store the registration number and give a reason for your answer.

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..... [2]

(b) A company sells used cars. Part of the class diagram for UsedCar is shown.



(i) State **one** method (operation) shown on the diagram.

..... [1]

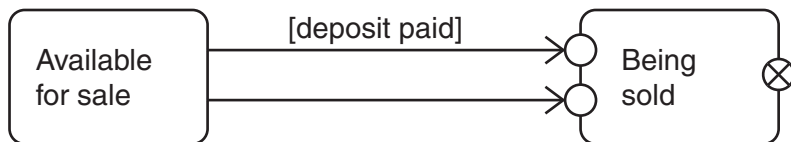
(ii) State **one** attribute (property) shown on the diagram.

..... [1]

(iii) State in which section of the diagram (X, Y or Z) yearOfManufacture should be shown.

..... [1]

(c) The diagram shows details of a used car described in (b).



(i) Give the correct name for this type of UML diagram.

..... [1]

(ii) State the meaning of the symbol ○

..... [1]

(iii) State the meaning of the symbol ⊗

..... [1]

7 (a) (i) State the purpose of syntax diagrams.

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

(ii) Give the correct name for another notation that can be used instead of syntax diagrams.

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

(iii) Draw a complete set of syntax diagrams to show label:

Label is a single letter chosen from A, B, C, D or E, followed by the symbol \* then any number (including zero) of digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9.  
For example, A\*, B\*3 and C\*456 are labels, but F\*7 and DE\*8 are not labels.

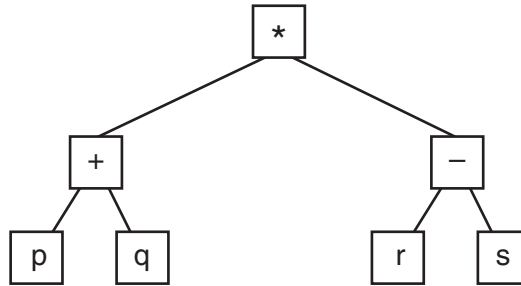
[5]

**Turn over for next question**

(b) (i) State **one** advantage of reverse Polish notation compared with the usual (infix) algebraic notation.

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

(ii) The binary tree shows operands p, q, r, s with operators \*, +, -



Obtain the reverse Polish form of the expression.

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..... [4]

(iii) Give the correct name for the type of tree traversal that should be used in (ii).

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..... [1]

8 (a) Describe **two** differences between machine code and assembly language.

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(b) Explain the use of an operand in an assembly language instruction.

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- 9 A database management system (DBMS) uses a data description language (DDL) and a data manipulation language (DML). Each statement given below may apply to a DDL, a DML or both. Tick **one** box in each row to show which is correct.

	DDL only	DML only	Both DDL & DML
It is used to create new tables.			
It defines foreign keys.			
It can query data.			
It can sort data into an order.			
It is used to update the data.			
It is a high level language.			
It is used for writing the schema.			

[7]

10 A school uses a relational database.

(a) Information is stored about students and subjects.

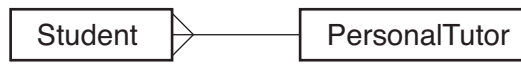
(i) State the relationship between the Student and Subject tables.

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..... [1]

(ii) Explain the consequences of this relationship.

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..... [3]

(b) The relationship of Student to PersonalTutor is shown on the entity-relationship (E-R) diagram.



(i) State the relationship shown.

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..... [1]

(ii) Explain the use of primary and foreign keys for Student and PersonalTutor.

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..... [5]

- (c) State the meaning of the term secondary key and give an example of the use of a secondary key in the school database described.

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..... [2]

- (d) Relational databases can be used to produce reports.  
Explain the term report and state **two** features, other than report layout, included in a report definition.

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..... [4]

**END OF QUESTION PAPER**

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