

Mark Scheme for June 2010

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the Report on the Examination.

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(1 mark per bullet point to maximum allowed)

- 1 (a)
- allocates memory to processes/programs
 - protects processes from each other
 - reallocates memory when necessary
 - protects operating system
 - deals with allocation when paging
 - enables memory to be shared

[max 4]

(b) description:

- round robin
 - each user allocated a time slice in turn
- or
- system of priorities/shortest job first/first come first served/least time remaining
 - highest priority first/(other further explanation)

purpose:

- to make efficient use of processor time
- to make efficient use of resources
- to provide no apparent delay for user
- to maximise throughput

[max 3 for purpose]

[max 4]

- (c)
- a map of where files are stored in backing store (sectors, grouped in clusters)
 - provides addresses/pointers to start of files
 - holds file names
 - holds file sizes
 - identifies free space
 - stores access rights
 - is updated by operating system/is used when files are saved or deleted

[max 4]

2 (a)

	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				✓

[1 per row, max 8]

[max 8]

- (b) • a token is a string of binary digits
 • ...of fixed length
 • tokens are created during lexical analysis
 • ... for the reserved words/keywords
 [max 2]
- 3 (a) • acts as a buffer/temporary store
 • ...for data...
 • ...or instruction...
 • ...when being passed between processor and memory...
 • ...during the fetch execute cycle/from address in MAR
 [max 3]
- (b) (i) • a signal...
 • ...that causes a break in the execution of the current routine/requests processing time
 [max 2]
- (ii) • to compare current task with interrupt
 • more than one interrupt can occur at a time
 • deal with the more urgent interrupt first...
 • ...because a more urgent interrupt has a higher priority
 • ...to avoid loss of data
 • eg store data when system failure is imminent – high priority
 • eg printer needs paper/data – low priority
 [max 3]
- (c) • PC holds the address of the next instruction
 • so next instruction is at 24
 • current instruction is a jump instruction/end of a loop
 [max 2]
- (d) • single control unit/processor manages program control
 • one instruction at a time...
 • ...in linear sequence
 • fetch-decode-execute
 • programs & data stored in same format
 [max 2]
- 4 (a) (i) • start at “Belfast”
 • look at each item in turn...
 • to compare with “Hull”...
 • until end of list/sequential search stopping at “London” as data in order
 • message indicating result (not found)
 [3]
- (ii) • mid point “London”
 • “Newcastle” > “London” so look in correct half of list
 • repeated halving of list...
 • ...until found
 • message indicating result
 [3]

- (b) (i)
 - faster (on average)...
 - as (generally) fewer items are checked [2]
- (ii)
 - file must be in order/more complex algorithm [1]

(c)

Instruction	Numbers					
Insert 7	2	7	16	3	21	14
• Insert 3	2	3	7	16	21	14
• No change	2	3	7	16	21	14
• Insert 14	2	3	7	14	16	21

[3]

- 5 (a)
 - close to design of computer/lack of portability
 - machine-oriented language
 - assembly language
 - used for tasks connected with running the computer
 - uses mnemonics for instructions
 - uses variable names for addresses
 - uses labels
 - (usually) 1-1 correspondence between low-level language and machine code
 - can contain macros [max 3]

- (b) (i)
 - direct addressing [1]

- (ii)
 - immediate addressing [1]

- (iii)
 - temporary storage (in the ALU)
 - holds data being processed/result of calculation
 - deals with the input and output in the processor [max 2]

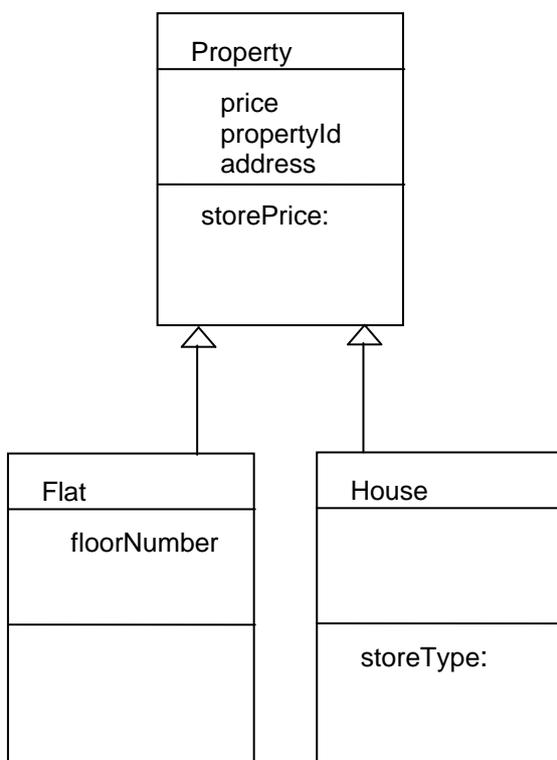
- (c) (i) $\langle \text{sum} \rangle ::= \langle \text{digit} \rangle \langle \text{sign} \rangle \langle \text{digit} \rangle$ [1]

- (ii) $\langle \text{small number} \rangle ::= \langle \text{digit} \rangle \mid \langle \text{digit} \rangle \langle \text{digit} \rangle$ [1]

- (iii)
 - $\langle \text{signed number} \rangle ::= \langle \text{sign} \rangle \langle \text{digit} \rangle \mid \langle \text{signed number} \rangle \langle \text{digit} \rangle$ [max 3]

- 6 (a)
 - Attends is one-many
 - WorksWith is one-one [max 2]
- (b) (i)
 - a unique identifier [1]
- (ii)
 - PatientId/DentistCode [1]
- (c)
 - a foreign key in Appointment (primary key in Patient)
 - to create relationship Attends/to link Appointment & Patient [max 2]

7 (a)



marks for:

- House in correct position
 - storeType in correct position
- [max 2]
- (b) (i)
 - a property of a class
 - eg price/address [max 2]
- (ii)
 - a class has its own attributes plus those from its superclass
 - a class has its own methods plus those from its superclass
 - eg Flat inherits price from Property [max 3]

8 (a) *(marks in pairs)*

- duplicate data stored ...
- ... so storage wasted/data inconsistent
- program-data dependence ...
- ... so difficult to change data format
- change of data ...
- ... may require rewriting file/may cause inconsistency
- lack of flexibility ...
- ... difficult to obtain new types of reports

[max 4]

- (b) (i)
- create tables/entities/relations
 - create attributes
 - define data types
 - define primary/foreign keys
 - define validation rules

[max 2]

- (ii)
- a high level language/4GL
 - used to access/query data
 - used to store data
 - used to update data

[max 2]

- (iii)
- names of tables/relations
 - define attributes
 - characteristics of data (eg length, data type)
 - restrictions on values of attributes
 - meaning of data columns
 - relationships between tables/relations
 - which programs can access data/access rights

[max 2]

- (c) (i)
- access data needed for their job
 - security eg senior staff update data, others have read only access
 - privacy eg salaries not seen by all staff

[max 2]

(ii) *(any sensible view 2 marks, with reason 1 mark) eg*

- details of all staff
- ... in given salary range
- to consider promotion/pay rises

or

- sales figures
- ... for month
- to compare staff efficiency

[max 3]

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