

## MARK SCHEME for the May/June 2006 question paper

### 5218 (8960) COMPUTING

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(Diploma)

Maximum raw mark 90

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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.

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- 1 (a) - the computer only understands binary  
 - HLL is written in language close to human language  
 - translator needed to turn one into the other  
 (1 per -, max 2) [2]
- (b) - interpreter translates one line of code and runs it  
 - before translating the next line  
 - original code is always present  
 - compiler translates entire code  
 - before allowing it to be run  
 - creates object code  
 (1 per -, max 4) [4]
- (c) (i) - translator program maintains a dictionary of reserved words  
 - if the reserved word used is not in this dictionary then an error has been made  
 - message may be given which suggests one close to spelling provided
- (ii) - variable names must follow the rules of the language  
 - translator tries the rules against the names used and reports any errors  
 - contents of variables must be of a specific type  
 - error created by the attempted use of anything else.  
 (1 per -, max 4) [4]
- 2 (a) (i) - designed for use by a technician  
 - shows how the system was put together/works  
 - so that a technician can alter the system  
 - correct the system when necessary  
 (1 per -, max 2) [2]
- (ii) - designed for the non computer literate user of the system  
 - provides training guides to teach the checkout operators  
 - provides simple instructions for use  
 - what to do when something goes wrong  
 (1 per -, max 2) [2]
- (b) (i) - needed to correct bugs found in the system once it is working  
 - e.g. There is no warning given that the till roll is about to end.
- (ii) - changes to the system because external things have changed  
 - e.g. the sales tax rate changes
- (iii) - changes which enhance/improve the performance of the system  
 - e.g. a flagging system at the tills to speed up the processing of bar codes [6]

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- 3** - to test out new parts without building them  
- saves time in development  
- to test safety features in crashes  
- saves money in development  
- to test safety features  
- saves risk of injury to humans  
- to give immediate readout of costings  
- as modifications are made the costs are shown immediately/no need for further work  
(1 per -, pairs marked on reasons, max 6) **[6]**
- 4** - message is stored until recipient ready to read it/can be stored for long period if desired  
- representative will not want to be interrupted during a sale  
- messages can be duplicated/each message can be sent to a number of recipients at a time  
- may want to send a message about a new product/offer to representatives in a particular area  
- messages can be forwarded/without the need for copying them  
- message may be received from one department and need passing on to another  
- messages can be encrypted  
- stops a rival firm learning trade secrets  
- positive responses can be given to show that a message has been delivered  
- can act as proof that an employee actually received an instruction  
- attachments can be used  
- to send brochures to team about new product  
(1 per -, max 4 pairs, max 8) **[8]**
- 5** - value in PC is...  
- copied into MAR  
- value in PC is incremented  
- data in the address referred to in MAR is...  
- copied into MDR  
- data in MDR is copied into CIR  
- contents in CIR are split into operation code and address  
- operation code is decoded as unconditional jump  
- value in address part of instruction is copied into PC  
- reset restarts the cycle.  
(1 per -, max 7) **[7]**

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- 6 (a) (i)** - data and the permitted operations on that data are defined together (class)  
 - objects in classes can pass messages from one to another  
 - classes can share some characteristics (inheritance, derivation)  
 (1 per -, max 2) **[2]**
- (ii)** - programs are expressed as a number of rules (relationships)  
 - and a set of facts  
 - program specifies what must be done, not how to do it.  
 (1 per -, max 2) **[2]**
- (b) (i)** - address in instruction is  
 - the address of the address of the data  
 suitable diagram worth two marks.  
 - used to access areas of memory that are not accessible using the space available for the address in the instruction code **[3]**
- (ii)** - address in instruction is added to  
 - a value held in a special register called the index register  
 suitable diagram worth two marks  
 - allows a set of contiguous data (array) to be accessed without altering instruction **[3]**
- 7** - different workers at the centre need access to different information  
 - doctor needs access to medical histories  
 - receptionist needs access to general information  
 - access can be of different types/RO and RW  
 - dependent on seniority/need to amend data  
 - some data is particularly sensitive and needs to be properly protected  
 - access controlled by passwords  
 - physical control of what can be seen through different machines and...  
 - specific times during the day/week when it is available to see/amend  
 - access rights determined by  
 - passwords/which machine used/user IDs...  
 - lead to different HCIs giving different views of the data  
 - sensitive files encrypted  
 - human right of privacy  
 - could be serious consequences (loss of job)  
 if information became known  
 (1 per -, max 6) **[6]**

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- 8 (a)** - dynamic data structure can alter size dependent upon the number of items stored/a static data structure remains a fixed size throughout its use.
- dynamic: list/tree
  - static: array
- [3]**
- (b) (i)** - advantage is that the programming is simpler/can be used as a validation check on number of students
- disadvantage is that large amounts of storage taken up even if there are few students/college roll can never exceed 1000/takes a long time to find a name.
- [2]**
- (ii)** must be a serial search. Whatever form candidate chooses.
- Mark points:
- set COUNTER to 0/1
  - compare Array(COUNTER) with X
  - if equal then report found and value of COUNTER, End
  - if Array(COUNTER) is empty then report error, not found
  - else increment COUNTER
  - if Counter > 999/1000 then report error, not found
  - else repeat from second point
- (1 per -, max 5)
- [5]**
- (iii)** - when student leaves then all students greater in the alphabet have to be moved up one place in the array
- when a new student arrives, the correct location in the array needs to be found and
  - the remaining students moved down one place
- (1 per -, max 2)
- a binary search (cut) may be used
  - involving looking at the centre value in the remaining part of the array at each pass
  - and then cutting number of items to be searched in half
  - Speeds up any searches that have to be made (because of reduced number of comparisons)
  - This is a fairly stable population so probably worth ordering.
- (1 per -, max 2)
- (max 4)
- [4]**

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- 9 (a) (i)** - used when there is not enough memory available  
- part of the storage is allocated to act as memory  
- this block is then imported to memory when it is needed  
- especially used when a piece of software is so big that it will not fit into memory  
(1 per -, max 2) **[2]**
- (ii)** - the division of memory into fixed size units  
- logical pages can then be assigned to any physical page in memory  
- records of the contents of each page in memory are kept in an index  
(1 per-, max 2) **[2]**
- (iii)** - the division of software into logical parts which are of different sizes  
- individual segments can be present in memory without the need for the whole program to be there  
- an index is required to store the beginning, size and contents of each segment  
- leads to fractionalisation of the memory  
(1 per -, max 2) **[2]**
- (b) (i)** - temporary storage of  
- input or output data  
- on some form of backing storage  
(1 per -, max 2) **[2]**
- (ii)** - jobs are stored on backing store  
- with reference to the job and its location stored on a spool/print queue  
- the jobs in the spool queue can be prioritized and...  
- the job reference can enter the queue at a position according to its priority  
(1 per -, max 3) **[3]**
- 10** - standardisation necessary so that computer systems can talk to each other  
- hardware standards like common access ports mean communication possible  
- common file formats  
- common communications media like  
- ISDN and  
- common communication protocols like  
- http  
- use of layered protocols to  
- allow manufacturers to design for a particular layer  
- standardisation of software (Use of Office by 90% of computer users)  
- standard character sets  
(1 per -, max 8) **[8]**

**[Total: 90]**