

## **MARK SCHEME for the October 2008 question paper**

<p><b>CAMBRIDGE INTERNATIONAL DIPLOMA IN COMPUTING</b> <b>5218 Further Systems and Software, Maximum mark 90</b></p>
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This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

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 must be read in conjunction with the question papers and the report on the examination.

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- 1**
- Cost of prototype to test is excessive/e.g. suspension on a car
  - Time to conduct real test is too long/e.g. results of crossing two plants
  - Danger from testing/e.g. testing is a warning system on a nuclear reactor
  - When a test is impossible to perform/e.g. can a space craft survive a meteor strike
  - Too many parameters to be isolated on real thing/e.g. testing to destruction – where is the break point on the object
- (Up to 2 per –, max 8) [8]

- 2 (a) (i)** – Code written in a high level language
- (ii)** – Code in machine code/result of source code being (compiled)/executable code/binary [2]

- (b)** – Compiler produces object code/object code must exist before code is run/error diagnostics reported for entire source code
- Interpreter does not produce object code of program/only produces m.c. of each statement/error diagnostics reported as error is met [2]

- (c) (i)** – Makes the run of the program more efficient (faster)/runs without the presence of the compiler/because no further translation needs to be done
- Makes the software more secure/cannot be altered because source code not present
- (ii)** – When writing a program/gives better diagnostics/will run despite not being complete
- (Up to 2 per –, max 1 – per dotted, max 4) [4]

- 3 (a) (i)** – Many to many [1]
- (ii)** – Use of link table
- which would be one to many and many to one with the tables
  - By removing many to many relationships
  - by removing functional dependencies [2]

**(iii)**



Mark points:

- A link table with a sensible name
  - Correct relationship STUDENT/LINK
  - Correct relationship LINK/TEACHER
- (1 per –, max 3) [3]

- (b) (i)** – Field or attribute in each record which uniquely/identifies the record
- StudentID/TeacherID/StudentIDTeacherID
- (ii)** – a field or attribute in one table which is the primary key in another table
- e.g. Student ID in the link table [4]

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- 4** e.g.
- Use of bold text/created by using tags <B> and </B>
  - Title (normally not shown)/stored in a table to allow searching for relevant data
  - Body of message/head of message/to split message into parts that can be treated separately
  - Blank lines, tabs, spaces.../to allow for formatting
  - Links/by using references
  - Images/by using <IMG...>
- There are many more.  
(Up to 2 per –, max 3 –, max 6) [6]
- 5 (a) (i)** – Bridge provides a link between two LANs  
– Used in this system to connect different office networks
- (ii)** – Switched hub which holds information about machines on the network  
– Used to direct data to correct machine from server on star network/used as gateway to another network e.g. connect company network to internet
- (iii)** – Used for changing the form of data which allows data to be sent over different media  
– May be used to provide a WAN linking headquarters to other locations
- (1 per –, max 6) [6]
- (b)** N.B. Not 'cost'  
Advantages:
- Do it in own time
  - Can redo sections/skip sections/according to ability
  - Does not cause worry/embarrassment
  - Office does not shut for training
  - Progress of workers can be monitored on the network
  - Course can be tailored for each worker
  - Training is about using computers, sensible to use computers for training
- Disadvantages:
- Help not available/help not tailored to needs
  - No common ethic to help workers through course/motivation difficult
  - Cheating easy
  - Worker must give up own time
- (1 per –, max 4 for advantages or disadvantages, max 6) [6]
- (c)** – A census of all available software and...  
– when it was purchased/whether up to date and...  
– how it is used  
– Check on software licenses/up to date/correct number of machines  
– Check on privacy measures/passwords/...  
– Check on security measures/backing up/firewalls/...  
– Check no piracy taking place  
– Ensure that access is available where required  
– Records of data files stored...  
– and time of use...  
– and user accessing it
- (1 per –, max 6) [6]

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- 6**
- (i) – Memory divided into fixed sized units
    - IAS is organised into physical pages
    - Jobs/Data are divided into page sized pieces
    - O.S. keeps an index of which jobs/data are in which pages
    - Pages requiring processing need to be in memory
    - Address may be in form of page and distance from start of page
  - (ii) – Jobs/Data are divided up into logical amounts...
    - each of which is of a different size
    - Memory tends to become fractured...
    - leading to compaction of memory being necessary
    - Address complicated by need to calculate from start of segment
  - (iii) – Used when not enough space in memory
    - Part of backing store used as though it were memory
    - Contents must be copied to memory to be used
    - Previous contents must be saved first
    - Too much use of virtual memory leads to disk thrashing
- (1 per –, max 3 per dotted, max 9) [9]
- 7**
- (a) (i) A (self contained) set of instructions/piece of code/subprogram/subroutine
  - (ii) Information about a data item being given to a procedure when it is called [2]
- (b) – Return address placed on stack
  - Values of parameters placed on stack
  - When necessary, values of parameters are read from stack and used
  - Return address is read
  - Calling program carried out from return address
(1 per –, max 4) [4]
- 8**
- (a) – Concept of a stored program
    - Instructions and data use the same memory
    - Use of a single processor
    - Follows a linear sequence of instructions
(1 per –, max 3) [3]
  - (b) (i) – Many (independent) processors working...
    - on the same program at the same time [2]
  - (ii) – Weather forecasting requires large volume of calculations
    - These can be speeded up because many can be done simultaneously
    - This means that more accurate forecasts are possible...
      - in restricted time frame
      - Requires complex programs writing
      - Requires complex operating system
(1 per –, max 4) [4]

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9 (a) INPUT STUDENT  
FOR COUNT = 0 TO 19  
IF ARRAY (COUNT) = STUDENT THEN REPORT 'FOUND', COUNT  
END  
END IF  
NEXT  
REPORT 'ERROR,NOT IN SET'  
END

Mark Points:

- Input of student name
  - Loop around selection...
  - with correct count/condition
  - correct IF... THEN...
  - with correct condition and...
  - correct output, including COUNT
  - Error report
- (1 per –, max 5)

Alternative response:

- Identify student
- Compare required student with...
- each name in turn
- Keep count of number of names looked at
- If name matches, then report...
- Count minus one
- If end of array reached then report error

[5]

- (b) (i) – Would take too long to search...
- because there is no indication of where to start...
  - because data is not in order
- (1 per –, max 2)

[2]

(ii) Alternative 1

- Binary search which...
- will require array to be sorted into alphabetical order
- Continual halving and take appropriate half
- because mean length of search is 500 searches for serial search and max length of search for binary search is 12 searches
- Non existence in array will make the length of serial increase to 1000 while the binary search remains at 12

Alternative 2

- Hashing algorithm
- Using Mod 1000
- To give index in the array
- Must use linked list to deal with clashes
- Immediate finding of name, no searching necessary

Alternative 3

- Indexed Sequential Search
- Array must be sorted into alphabetical order
- Initial letters stored in index
- Serial search from initial index given
- Length of search dependent on number of students with that initial, will be <1000

(1 per –, max 3)

Note: One mark reserved for comparison with serial method

[3]

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**10** (i) – Lower case letters are not defined [1]

(ii) e.g. < TERMINATOR > ::= . | ?  
 < SPACE > ::= ^  
 < GROUP > ::= < WORD > < SPACE >  
 < SET > ::= < GROUP > < WORD > | < GROUP > < SET >  
 < SENTENCE > ::= < SET > < TERMINATOR >

Mark Points:

- Define Terminator
  - Define Space
  - Define Group
  - Define Set
  - Define Sentence
- (1 per –, max 5)

[5]