

MARK SCHEME for the October/November 2012 series

9691 COMPUTING

9691/33

Paper 3 (Written Paper), maximum raw mark 90

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Page 2	Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2012	9691	33

- 1 (a) (i) -An attribute/or combination of attributes
-Which ensures the records in the table are unique [2]
- (ii) -the primary key from Entity X
- Matches to the foreign key
-The same key in table Y
-Many records from entity Y will have a matching record in entity X [3]
- (b) (i) -Two sensible attributes for Student (but none which relate to the Book or Loan tables)
- Two sensible attributes for Book (but none which relate to the Student or Loan tables) [2]
- (ii) *Loan table*
-Loan attributes include StudentID and BookID
-Primary key StudentID + BookID + IssueDate [2]
- (ii) *Data inconsistency*
-Copies of a data item appear in a table and are not consistent with a copy in a second table
-For example - a person who changes address - address changed in one table but original address still appears in some other table [2]
- [Total: 11]**
- 2 (a) (i) -90 [1]
- (ii) -38 [1]
- (iii) A6 [1]
- (b) (i) -1 as a carry bit
-0101 0011 [2]
- (ii) -The required result is outside the range of the integers permitted using only 8-bits
-Overflow has occurred
(1 per -, max 1) [1]
- (c) (i) +5 [1]
- (ii) +22 [2]
- [Total: 9]**

Page 3	Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2012	9691	33

- 3 (a) (i) At step 4 ...
 -The contents of the Memory Data Register are copied to the Current Instruction Register [1]
- (ii) *At step 3...*
 -The Memory Address register contains an address
 -Copy contents of this address to the Memory Address Register [1]
- (b) (i) -The processor can directly understand each instruction
 -Instruction requires no translation before they can be executed [1]
- (ii) -The assembler software translates each assembly language instruction into machine code
 -Takes the source file and produces an object/executable file
 -Finds and reports all errors in the source/assembly language program
 -Looks up the binary code for each instruction
 -Constructs a symbol table for all symbolic addresses used by the programmer
 (1 per -, max 3) [3]
- (c) (i) *Direct addressing*
 -the operand part of the instruction is treated as an actual memory address
 -e.g. LD 1087 will load the contents of memory address 1087 to the Accumulator [2]
- (ii) *Relative addressing*
 -all addresses are formed by adding a constant number to each address
 -the offset to be added is held in a base register
 -relative addressing allows for relocatable code
 (1 per -, max 2) [2]
- [Total: 10]**

- 4 (a) *Compiler*
 -an object file
 -reports all errors
 -symbol table
 (1 per -, max 2) [2]
- (b) *Advantages of an interpreter ...*
 -The entire program does not have to be written before an attempt can be made to execute it
 -Program development likely to be faster
 -Better diagnostics
 (1 per -, max 2) [2]
- (c) *Syntax analysis*
 -The compiler will make reference to meta-language statements (e.g. BNF)
 -The statements describe all possible forms of construction for each keyword
 -Similar meta-language rules exist for permitted identifier names
 -Errors is either the statement composition or identifier names are reported
 (1 per -, max 3) [3]

Page 4	Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2012	9691	33

(d) *Linker and loader*

Linker software

- links segments of code
- which have been compiled independently
- needed when the programmer has developed program libraries (which can then be used by many applications)

Loader software

- loads object/executable code into main memory
 - many are relocatable loaders
- (1 per -, max 2)

[2]

[Total: 9]

- 5 (a) The first item to join the structure will be the first item to leave
NB Acronym insufficient

[1]

(b) (i)

```
PROCEDURE AddToQueue
  IF TailOfQueue = 101
    THEN
      Output "Refused - Queue is already FULL"
    ELSE
      INPUT NewItem
      MyQueue(TailOfQueue) ← NewItem
      TailOfQueue ← TailOfQueue + 1
    ENDIF
  END PROCEDURE
```

Mark as follows:

- TailOfQueue = 101
- NewItem assigned
- Assigned to MyQueue[Tail]
- TailOfQueue ← TailOfQueue + 1

[4]

(ii)

```
PROCEDURE RemoveFromQueue
  IF Head + 1 = Tail
    THEN
      Output "Refused - Queue is already EMPTY"
    ELSE
      Output MyQueue(HeadOfQueue)
      HeadOfQueue ← HeadOfQueue + 1
    ENDIF
  END PROCEDURE
```

Mark as follows:

- Test for empty queue
- Output "Empty queue message"
- Item leaving is MyQueue[HeadOfQueue]
- HeadOfQueue incremented

(1 per -, max 2)

[2]

Page 5	Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2012	9691	33

(b) Application of a queue ...

-One mark for the application

- Characters arriving in a keyboard buffer
- Spooling of print jobs by the operating system
- Anything reasonable

-Final mark for justification for queue

[2]

[Total: 9]

6 (a) Strategies for use of the processor

Round robin

-each job gets a time slice in turn

-Each job is allocated a set amount of time for use of the processor

-All loaded jobs will get some use of the processor

Allocate priorities for all jobs

-Jobs which require a lot of processing get low priority / jobs which do little processing get high priority

-Aim is to get a high throughput of jobs

Max 2 for each strategy

[4]

(b) (i) Any two ...

-A peripheral e.g. printer

-to inform the processor it is out of paper/paper jam/ or similar

-user

-has pressed the 'Reset' button

-keyboard

-has generated an interrupt to say data has been entered and requires saving

-mouse

-has generated a signal e.g. click which will result in some action e.g. a refresh of the screen

-clock interrupt

-must complete the current f-e cycle

-software generated interrupt

-divide by zero error

(1 per -, max 2)

[4]

Page 6	Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2012	9691	33

- (iii) -Determine the source of the interrupt
 -Mask out all interrupts of a lower priority
 -Save the contents of the Program Counter
 -Save the contents of all other registers (on the stack)
 -Load the appropriate Interrupt Service Routine (ISR)
 -Run the ISR code
 -Restore the contents of the registers
 -Restore the contents of the PC
 -Restore all lower priority interrupts
 -Resume the next process

[5]

[Total: 13]

- 7 (a) Two different media
 Copper wire

-Many different variations - coaxial - twisted pair - thick Ethernet - thin Ethernet

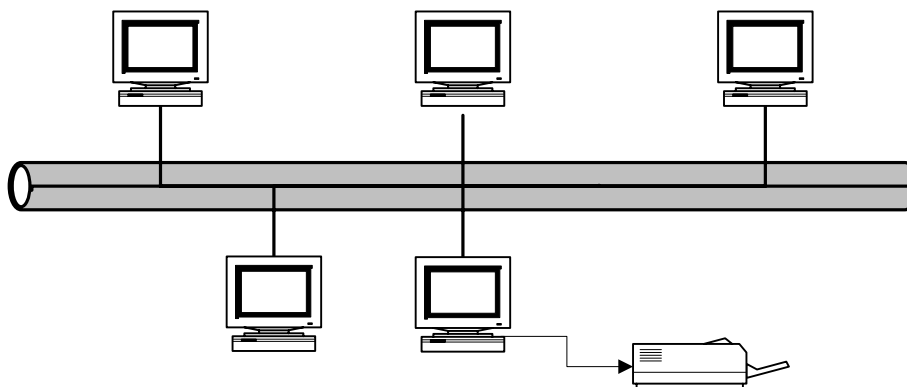
Optic fibre cabling

-Separate fibres used for separate signal
 -Data travels very fast

Radio/Microwave signals

-Wireless communication

[4]



- (b) (i) -Single cable run
 -Four computers attached
 -Computer with printer attached
 -Terminators

NB If the graphic is not a clear attempt at a computer - it must be clear that the 'boxes' are labelled in some way to indicate 'computer'
 (1 per -, max 3)

[3]

- (ii) -WAN is a collection of computer or networks which are connected
 -Over a wide geographical area
 -Or by example e.g. the Internet
 (1 per -, max 2)

[2]

Page 7	Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2012	9691	33

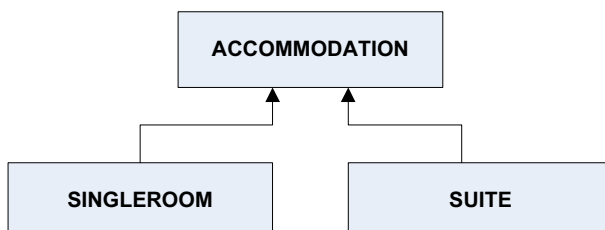
- (iii) -Use of user Ids with password
- Used to gain access to the network/authorise use of the computer system
- Use of encryption
- Transaction data/debit/credit card data is particularly sensitive
 - Safeguard the data against unauthorised reading
 - Data should be sent using SSL / over a secure connection only
- Authentication
- General description of any technique which addresses the issue of the need to 'authenticate' the user of the computer system
- Authorisation
- General description that the user is 'authorised' - using network account settings - to perform certain actions
 - Access to some software is available to selected users from certain computers only
 - File access rights determine 'who can do what'
- (max 2 for each technique)

[Total: 15]

- 8 (a) (i) function name: SumRange
parameters: ThisInteger1 and ThisInteger2 [2]
- (ii) 42 [1]
- (iii) Error [1]
- (iv) Error [1]
- (v) Error [1]
- (b) A function always returns a value - (procedures may/may not return a value) [1]

[Total: 7]

- 9 (a) Mark as follows:
3 Classes
Correct hierarchy
Arrows point to parent class



[3]

Page 8	Mark Scheme	Syllabus	Paper
	GCE A LEVEL – October/November 2012	9691	33

- (b) -A class is the design / the blueprint (from which objects are later created)
-An object is an instance of a class
-An object must be based on a class definition
-Many objects can exist for the same class
-A class consists of properties and methods
(1 per -, max 2)

[max 2]

- (c) -Encapsulation means an object can only supply its property values through methods designed for reading and storing of the data
- (E.g. The ACCOMMODATION class)
-would require both a 'getRoomNo'
-and 'setRoomNo' method

[2]

[Total: 7]