Paper 3

Question 1

Name **three** different types of bus in a processor and state what each is used for.

Mark scheme

e.g.-Data bus
-to carry data from one location to another in processor // e.g. from MDR to CIR

-Address bus
-carries the address of a memory location // e.g. Address of location in memory from MAR

-Control bus
-Carries control signals around processor // to synchronise the operation of the processor components // by example: memory read/write completed // each line carries a different signal.
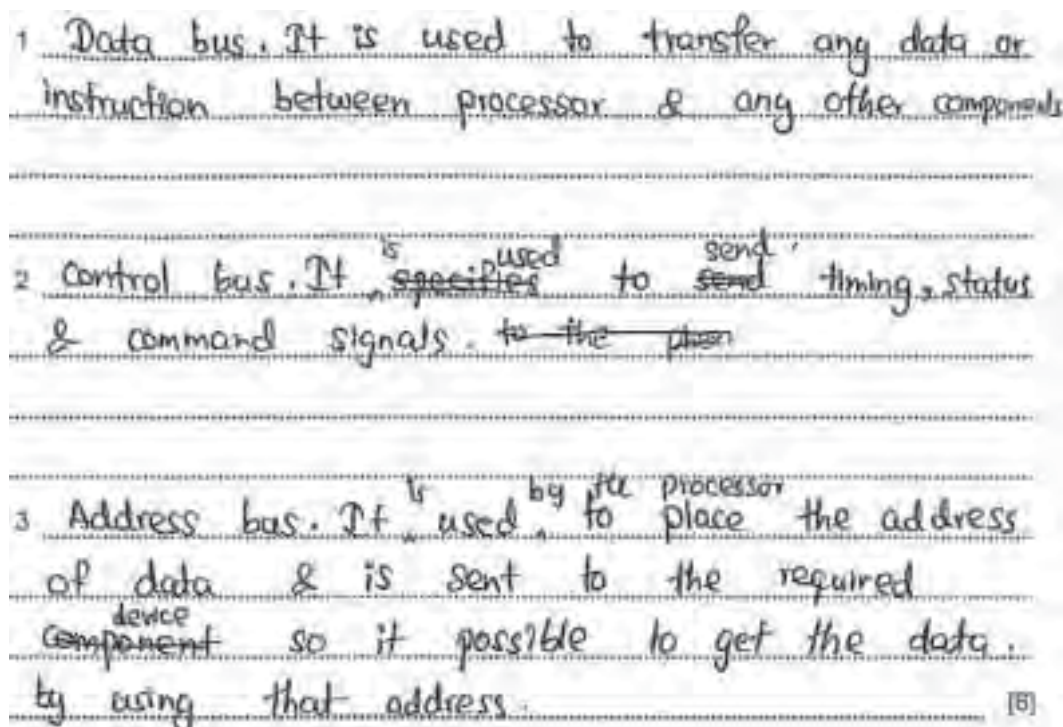Accept: system bus, memory bus, firewire, USB, PCI + explanation
(2nd mark is dependent on correct bus name)

(2 per -, max 6)   [6]

Example candidate response – grade A

1 Data bus. It is used to transfer any data or instruction between processor & any other components

2 Control bus. It is used to send timing, status & command signals.

3 Address bus. It is used by the processor to place the address of data & is sent to the required device component so it possible to get the data. by using that address.   [6]

Examiner comment

The candidate is able to name the three common buses and follow each with a clear and detailed explanation.

Example candidate response – grade C

1 Control bus :-
- Its a bidre bidirectional bus, data can be carried in both direction
- Its purpose is to transmit command, timings and specific status information.

2 Data bus :-
- It may consist of 8, 16 or 32 separate lines.
- The width of the data bus is a key factor in determining overall system performance.

3 Address bus :-
- when a processor wishes to read a word from memory, ~~data~~ *address* is sent thro. usin this bus.
- Its width determines the maximum possible /~~capacity~~ *memory* capacity of system.   [6]

Examiner comment

The candidate knows the names of the three main buses but is unable to give a clear description of two of the three.

Example candidate response – grade E

1 Address bus, used to carry the address of the item of data or instruction between registers

2 data bus, used to carry data around ~~between~~ from 1 register to another. (between registers)

3

[6]

Examiner comment

The candidate knows the correct names for only two of the buses but is able to describe only partially the use of these.

Question 2 (a)

Explain the relationship between assembly languages and machine code.

Mark scheme

-One to one
-Mnemonics are used to represent operation codes
-Labels are used to represent memory addresses
-machine code is <u>binary</u> codes (only)
-assembly code can not be executed // machine code can be executed
-machine code and assembly language are both low level languages (machine specific)

(1 per -, max 2)   [2]

Example candidate response – grade A

Examiner comment

The candidate has described two of the key features for assembly language and machine code. The third point is not precise enough. Candidates at a grade A level should have an understanding that even high-level language programs are stored within computer systems as 0s and 1s. The difference is that machine code consists of binary codes.
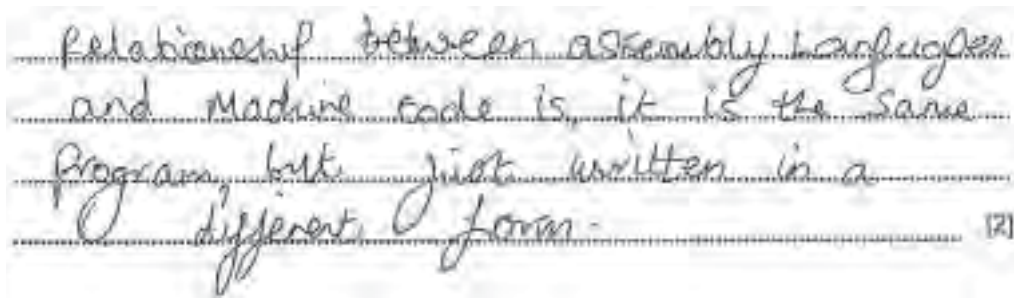
Example candidate response – grade C

Examiner comment

Grade C candidates mostly scored with the most fundamental statement – that "there is a 1-to-1 correspondence".

Example candidate response – grade E

> Relationship between assembly languages
> and Machine code is, it is the same
> program, but just written in a
> different form. [2]

Examiner comment

This is a good example of an answer where some of the candidate's statements are correct but they do not answer the question.

Question 2 (b)

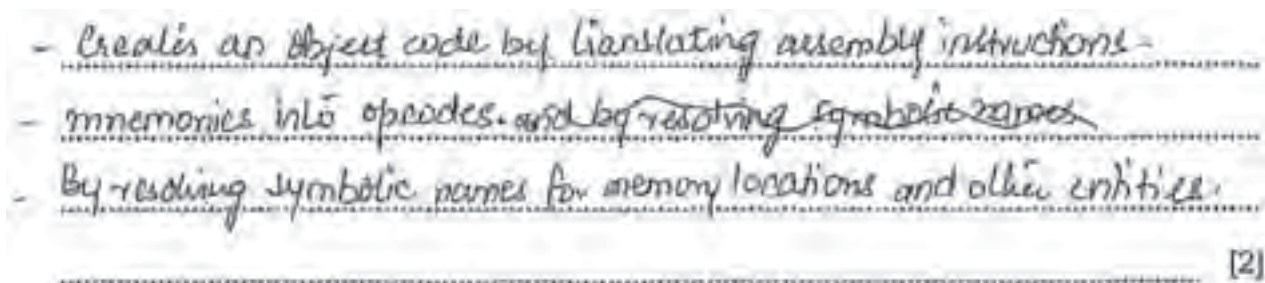Describe how an assembler produces machine code from assembly language.

Mark scheme

-Labels added to a symbol table
-Labels are later looked up to determine the actual address / Assembler must allocate addresses to labels
-Mnemonic looked up in opcode table to find operation code
-Macro instructions used to stand for groups of instructions

(1 per -, max 2) [2]
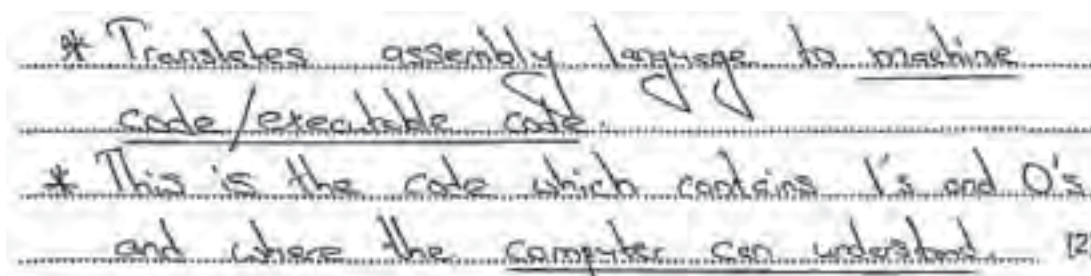
Example candidate response – grade A

> - Creates an object code by translating assembly instructions
> - mnemonics into opcodes. and by resolving symbolic names
> - By resolving symbolic names for memory locations and other entities. [2]

Examiner comment

The candidate knows that symbolic names are used for memory addresses but does not follow this with a description of how an op-code table and symbol table are used during the translation process.

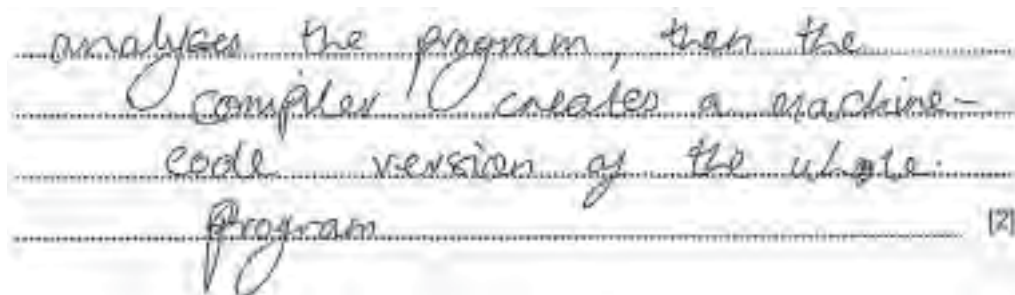## Example candidate response – grade C

> * Translates assembly language to machine code/executable code
> * This is the code which contains 1's and 0's and where the computer can understand [2]

Examiner comment

The candidate knows that machine code consists of 0 and 1 digits only and that machine code is executable code (This is not a strong answer).

Example candidate response – grade E

...analyses the program, then the compiler creates a machine-code version of the whole program [2]

Examiner comment

The use of mnemonics was expected as an answer for **2 (a)(i)**. However the mark scheme has allowed this mark to be available and credited here for **(ii)**.

Question 2 (c)

The address part of a low-level instruction can be the address of the data to be used.
This is a direct address.

Describe the following types of addressing:

(i) Indirect addressing;

(ii) Indexed addressing;

(iii) Relative addressing.

Mark scheme

(i) -Address in instruction is the address of the address of / pointer to the location...
-which contains the data to be used [2]

(ii) -Address in the instruction has added to it
-the contents of the Index Register/IR [2]

(iii) -Address in the Instruction is the displacement
-from the address of the first/current instruction
-the value is added to the PC [2]

Example candidate response – grade A

(i) Indirect addressing;

– the address of the instruction is the address of the address of data

– used to access areas of memories that are not easily accessible

– using space available in memory for address in the instruction code.

[2]

(ii) Indexed addressing;

– the address of the instruction is added to a value held in an index register.

– allows data to be contiguous (array) without altering instructions.

[2]

(iii) Relative addressing.

– the address of the instruction is relative.

– to the specific first value in the instruction.

[2]

Examiner comment

Part **(i)** – A clear description – "the address of the address of the data value to be used".

Part **(ii) –** There is a clear description of the use of the Index register contents. The candidate has followed this with a practical application where it might be used which was not asked in this question and so was ignored when marked.

Part **(iii)** – The candidate has tried to use the key word 'relative' to formulate an answer but there is no reference to a number of locations from a specific reference point such as the address of the current instruction.

Example candidate response – grade C

(i)   Indirect addressing;

    * Address is in the part of the
      instruction
    * Address in instruction is the address to
      the data to be followed.   [2]

(ii) Indexed addressing;

    * Address is added to the value of the
      index register (IR)
    * Index register then incremented.

                                                    [2]

(iii) Relative addressing.

                                                    [2]

Examiner comment

Part **(i)** – This describes direct addressing, not indirect.

Part **(ii)** – The candidate has remembered that the Index Register contents is used for indexed addressing. The candidate has gone on to say that the Index Register contents will be incremented – (which may or may not follow) and this has been ignored by the examiner.

Part **(iii)** – Not attempted.

Example candidate response – grade E

(i)   Indirect addressing;

    Is passing the address of one

    [2]

(ii)   Indexed addressing;

    the address of the memory location where
    the data another is held is added to the
    data and then pass as one

    [2]

(iii)   Relative addressing.

    hold the address of the jump
    instruction

    [2]

Examiner comment

Part **(i)** – No hint that the address is a forwarding address to a second memory location.

Part **(ii)** – A generous one mark for remembering that the address has something added to it. There is no mention of the use of the Index Register.

Part **(iii)** – No understanding that the number in the operand part is a 'displacement' from the current address.

Question 3

Discuss the different types of data transmission media. Include a comparison of data transfer rates and transmission ranges in your answer.

Mark scheme

-Coaxial cable
    -description/one transmission medium (copper) surrounded by insulation

-Twisted pair
    -description/two conducting wires twisted around each other

-Optic fibre
-many fibres contained
    -description/fine glass strands carry light signals // optic fibre is very fragile
    -Interference free

-Wireless communication
    -Radio signals
        -open to interception / latency / uses WEP keys for security

-Infrared/Microwave
        -restricted by line of sight
-transfer rate statement
-range statement

(1 per -, max 8)   [8]

Example candidate response – grade A

Twisted copper pair cable in used to transfer data to a short distance inside a building. This is because the data get corrupted & it picks up noise. The transfer rate is lowest in Copper cables (about 5 kBs⁻¹). Optic fibre transfers data very fast (about 100 kBs⁻¹) & is ideal for transfering data for large distance. Data doesn't get much corrupted & large amount of data can be transferred.

Coaxial cables is a copper cable with several shielding to prevent it from picking up noise. The data transfer rate is normally 20 kBs⁻¹.

Wireless communication uses the air as a media to communicate between the computer. So it is possible for the user to move around by keeping the communication link. But there is limitation for the communication (within a building). [8]

Examiner comment

Not a perfect answer as the candidate should have deduced that 8 marks available should have meant that four 'media' were needed each with an explanation. The question brief has been followed with a comparison made of transfer rate and distance.

Example candidate response – grade C

- Cables = Cheap, restrict how far units can be not secure can be 'tapped'. Suitable for short ranges. Data prone to attenuation
- Microwave link= Expensive. Data needs regular amplification. Communication Global use for really long distances
- Optic fibres - Cheap but secure. Use pulses of light to transfer data. Very fast. Can't be tapped but are still restrictive -
- Wireless through routers - Can make a LAN without use of wires within a building. has negligible attenuation
- Radiowaves - Global wireless communication through satellite. Channels of one country can be viewed in another. Large data transfered
- Hardware - like CD's usb's etc. Data size restriction [8]

Examiner comment

Well presented answer. The candidate could have given some of the detail of cabling but did not and instead went on to describe other transmission media. A grade C candidate should be able to score well on an open-ended question like this.

Example candidate response – grade E

UTP is the one with the lowest range, then
we have STP which is like UTP but shielded and
can go a little further. They have medium
transfer rates.
Coaxial can go very far but the transfer
rates are very slow.
fiber optics can go to extremly far and the
transfer data is very fast.

[8]

Examiner comment

A minimalist answer where the candidate has suggested three different cable types. There was a second mark available for describing the make-up of each one which was not attempted. The candidate (just) gets the fourth mark for describing that twisted pair cabling will have the shortest range. Note that stating that "Fibre optic .... is very fast" is not a comparison as asked for in the question stem.

Question 4

(a) State what is meant by a real-time application.

(b) An air conditioning system is a real-time application.
Explain how sensors and actuators are used to control an air conditioning system in an apartment.

(c) Give **one other** example of a real-time application. Justify why your choice is a real-time application.

Mark scheme

(a) -A system in which the output is produced quickly enough to affect the next input /current process
-a system that reacts fast enough to influence behaviour in the outside world   [1]

(b) -A number of <u>sensors</u> stationed around apartment
-Temperature/humidity <u>sensor</u> sends temperature/humidity to processor
-Use analogue to digital converter to convert the temperature/humidity measurements

-Processor decides whether air conditioning system is in operation

-(processor) compares measured temperature/humidity to required temperature/humidity

-If necessary <u>actuator</u> is used to adjust settings/turn on cooling/heating/humidifier

-Delay before next reading is taken from temperature/humidity sensor. // temperature readings are sampled // taking readings is repeated

-Sensors on windows to warn if they are open during operation.
(1 per -, max 4)   [4]

(c) Any suitable real-time or pseudo-real-time application e.g.

-To play a racing game

-So that the player can steer the car realistically

-any reservation type system

-to prevent double booking   [2]

Example candidate response – grade A

(a) State what is meant by a real-time application.

Where data input need to be processed and information output immediately to affect the next input.   [1]

(b) An air conditioning system is a real-time application.
Explain how sensors and actuators are used to control an air conditioning system in an apartment.

• Sensors detect temperature in the apartment and send the data to the processor.

• The processor compares it with pre-set parameters to decide whether it is too hot, or too cold.

• If so, signals are sent to the actuators to take the necessary action. Eg:- If too cold, turn on the heater or stop cooler.

• Data captured by sensors are continuously processed [4] _as such to ensure that the desired temperature is maintained._

(c) Give one other example of a real-time application. Justify why your choice is a real-time application.

Example _Controlling a nuclear power plant._

Justification _Data collected from sensors should be processed immediately and necessary action taken to avoid any disastrous situation._   [2]

Examiner comment

Part **(a)** is a 'bookwork' definition which has been reproduced.

Part **(b)** – An excellent answer which clearly describes the key role of the processor at the centre of receiving data from the sensor(s) and then, when required, sending signals to an actuator.

Part **(c)** – This is a commonly quoted application which uses real-time processing and well explained.

Example candidate response – grade C

(a) State what is meant by a real-time application.

‑receives data

‑and output them as movement, sound etc out [1]

the same time

(b) An air conditioning system is a real-time application.
Explain how sensors and actuators are used to control an air conditioning system in an apartment.

‑ Sensors

‑Temperature sensor estimates the temperature every 5minutes e.g.

‑if it to higher that than the appropriate

Actuator
‑ a motor is start to produce cold air

‑when the temperature falls

‑ the motor stops   [4]

(c) Give one other example of a real-time application. Justify why your choice is a real-time application.

Example robot in a factory carrying different parts

Justification ‑suppose it has a radar sensor

‑ it approaches something in its route

‑ it stops so as not to sell make a [2]

collossion

Examiner comment

Part **(a)** – A grade C candidate should be able to reproduce a 'bookwork' definition.

Part **(b)** – This is a weak answer; that the application will use temperature sensors and the idea that there is a critical temperature at which 'something' will happen. No suggestion as to how the sensors, processor and actuator interact.

Part **(c)** – One of the standard bookwork type applications and this has been followed by a clear explanation.

Example candidate response – grade E

(a) State what is meant by a real-time application.

This is when data is processed immeditely after input and output given out inreadifely [1]

(b) An air conditioning system is a real-time application.
Explain how sensors and actuators are used to control an air conditioning system in an apartment.

Thermometers and like sensors which are put int different parts of the apartment. A computer calculates the average of the all after some-time. If reading is above the stated range of cool then air conditioners (actuators) are turned on until the temperatures fell to the required range. [4]

(c) Give one other example of a real-time application. Justify why your choice is a real-time application.

Example Braking is a computer racing game.

Justification This will require it because braking will need immeddiate response or else accident or in the game since the car will not stop immediately [2]

Examiner comment

Part **(a)** – A very typical answer from a weak candidate – they clearly have learnt the standard definition of 'real-time'.

Part **(b)** – Note the first sentence simply copies the question. Credit is given for the idea of a critical temperature and the explaining that a signal is sent to the actuator.

Part **(c)** – The application and explanation has nothing to do with real-time. There are many topics where it is good exam revision practice to learn a definition AND a simple example to support this; this is what parts **(a)** and **(c)** of this question are asking for.

Question 5

(a) Describe what is meant by the spooling of files.

(b) (i) State why files which are sent to a shared printer on a local network will be spooled.

(ii) Explain how this spooling is carried out.

Mark scheme

(a) -Temporarily storing data for output later
-several computers can send data to be printed at the same time
-when queuing jobs sent to a single device
(1 per -, max 2)   [2]

(b) (i) -Jobs can be queued to ensure that none are missed
-Stops jobs being frozen/lost when printer unavailable
-complete documents are printed

(ii) -print jobs are stored on secondary storage
-jobs can be given a print priority
-jobs are maintained by a queue / priority queue data structure
-data structure consists of reference data to each print job
-When printer free, job with highest priority / at head of queue is printed
-print files are sent from secondary storage to print buffer.
(1 per -, max 4 per dotty, max 5)   [5]

Example candidate response – grade A

(a) Describe what is meant by the spooling of files.

.......Spooling....is...the....process....of....~~staring~~ ^{storing}....the....inputs....or........
.....outputs....~~tca~~....of....the....system....temporarily....on a....some....form........
......of....backking....storage..

[2]

....

(b) (i) State why files which are sent to a shared printer on a local network will be spooled.

......There...may...be...many...files...which...are...sent...for...printing.....
.....The...purpose...of...the...operating...system...is...to...~~first~~...schedule.....
.....these...jobs...and...order...them...according...to...the...rules...of........
.....scheduler - Therefore. If. the...processor is...working...on another...job...these.....
.........jobs....will....wait...in...the...print...spooler...till...~~they~~...~~get~~...~~to~~...the...processor...becomes.....
....^{free to service these jobs}

(ii) Explain how this spooling is carried out.

......Each...job....will...be....given...a....priority...according...to.....
.....the...importance...of...job...or...type...of...job...or...size...of...job...or...amount.....
.....of...time....already....waited....or....amount....of....pheripheral...time...required....etc.....
.....According...to...the...priority...of...each...job...the...job...with...the...highest.....
.....priority....will...be...at....the...top...of...the...spooling...queue...to...be...~~serviced~~ ^{printed}...first.....
.....and...the...job....with...the...lowest...priority...will...be....at...the...bottom...of...the....[5]
.....spooling....queue...which...will...be...~~printed~~...at...~~last~~...the...last...one...to...be.....
.....Printed.

Examiner comment

Part **(a)** – This answer does not go on and give a 'common sense' reason for using spooling.

Part **(b) (i)** – A good clear answer which describes how the print jobs would be managed. There is a lot of detail given about how priorities might be allocated but this was not asked for in this question.

Part **(b) (ii)** – Some of the mark points which would score here are little more than common sense and the candidate knows that a commonly used data structure is a priority queue.

Example candidate response – grade C

(a) Describe what is meant by the spooling of files.

— Spooling means storing data temporarily.
— on a disk for faster processing.

[2]

(b) (i) State why files which are sent to a shared printer on a local network will be spooled.

— Printer is a slow peripheral device it may make users wait for long.

— To avoid delays, faster processing is done.

— Computer can also perform other tasks in the background.

(ii) Explain how this spooling is carried out.

— All the printer jobs are stored in a form of queue.

— in a fast queue device such as disk.

— It comes out of the spool and gets processed.

Data   Process   Output

[5]
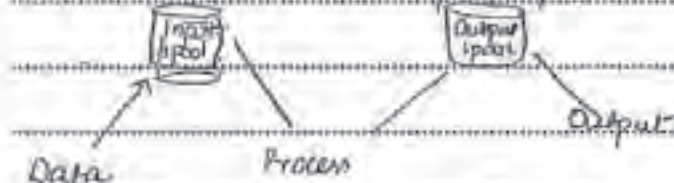
Examiner comment

Part **(a)** – Some idea given that spooling involved the temporary storage of data.

Part **(b) (i)** – Has not answered the question. Some of the points are true but do not convey any 'common sense' reasons why spooling is used.

Part **(b) (ii)** – Some understanding shown which follows on from the answer given for **(a)**.

Example candidate response – grade E

(a) Describe what is meant by the spooling of files.

Spooling is used for Slow devices
Such as Printer. first data is
Stored in Storage device after Storage
it Comes to Spooling Queue. [2]

(b) (i) State why files which are sent to a shared printer on a local network will be spooled.

Because the Printer input is first
goes to hard drive then Search
for Spooling Queue.

(ii) Explain how this spooling is carried out.

The files are moved to Storage
device then after It's Process the
files moves in Spooling Queue
for Processing. [5]

Examiner comment

Part **(a)** – This candidate has some idea what is meant by spooling but is unable to answer the question set.

Part **(b)** – A minimalist answer. However, two correct key points are made – that the files go to the hard drive and are managed with a queue data structure. The marking of this question was flexible as candidates sometimes scored marks for **(ii)** in their answer for **(i)** and vice versa.

Question 6

Describe the purpose of the following parts of a database management system (DBMS).

(i) Data Description Language (DDL)

(ii) Data Manipulation Language (DML)

Mark scheme

(i) -language to describe/alter table designs (NOT file)

-includes Identifiers/data type/relationships

-any validation rules that the data must adhere to…

(1 per -, max 2)   [2]

(ii) -designed to allow a user to query/retrieve data/sort the database

-insert / delete / update

-data in the database / table(s)

(1 per -, max 3)   [3]

Example candidate response – grade A

(i) Data Description Language (DDL)

- Creates attributes
- Difines primary/secondary/foreign keys

[2]

(ii) Data Manipulation Language (DML)

- Allows the user:
  • To access queries
  - Update data
  - Input data

[3]

Examiner comment

Part **(i)** – A good clear answer – probably the candidate has had practical experience of the use of SQL.

Part **(ii)** – A good clear answer – again probably the candidate has had practical experience of the use of SQL.

Example candidate response – grade C

(i) Data Description Language (DDL)

- DDL used by data base designers.
- describes the data types and specific details about data base.

[2]

(ii) Data Manipulation Language (DML)

- Allows users to perform tasks.
- user can delete, store data
- retrieve, and search insert and search data.

[3]

Examiner comment

Part **(i)** – Some understanding that the DDL will involve the setting of data types for various attributes.

Part **(ii)** – Some understanding and the key tasks of 'retrieving' and 'deleting' data. Note, if only the answer had stated that data is deleted 'from a database table' this would have scored a further mark. A good example of a candidate needing perhaps to pause and formulate their answer before they start writing.

Example candidate response – grade E

(i) Data Description Language (DDL)

DDL are used by the database writer and programers to design tables in air file a database.

[2]

(ii) Data Manipulation Language (DML)

Allow users who are using the database to copy data, Import data delete data, input data etc.

[3]

Examiner comment

Part **(i)** – A good clear answer "to design tables" but has failed to give any detail about this for the second available mark.

Part **(ii)** – "Import data" does not score – the mark is for "delete data", but the candidate did not say 'from the database table'.

Question 7

Part of the information stored in the data dictionary describes the type of data which is being stored.
A particular piece of data is 10010110.
State what the data stands for if the data dictionary describes it as:

(i) a two's complement binary number;

(ii) a sign and magnitude binary number;

(iii) a binary coded decimal number.

Mark scheme

(i) –106 [1]

(ii) –22 [1]

(iii) 96 (1 per digit) [2]

Example candidate response – grade A

(i) a two's complement binary number;

- 128 64 32 16 8 4 2 1

10010110

Its the number -106   [1]

(ii) a sign and magnitude binary number;

sign = 64 16 8 4 2 1

10010110

Its the number -22   [1]

(iii) a binary coded decimal number.

8 4 2 1   8 4 2 1

1001 0110

9   6

Its the number 96   [2]

Examiner comment

A grade A candidate should have no problems with these number conversions. Note for all three parts of the question the candidate has shown some working to illustrate to the examiner how they have arrived at the answer.

Example candidate response – grade C

7   Part of the information stored in the data dictionary describes the type of data which is being stored.
    A particular piece of data is 10010110.
    State what the data stands for if the data dictionary describes it as: +

-128
-22
-106

1.16
5

12.8
128
136

(i) a two's complement binary number;

128
16
8
1810
-128
22

original   011 01.0 10   0110 1010

23   1001.01.10

[1]

(ii) a sign and magnitude binary number;

111 01010

32
64
96

[1]

(iii) a binary coded decimal number.

1001 0110

= 96

[2]

Examiner comment

A grade C candidate should be confident in performing these number conversions.

This is a very typical answer where part **(i)** is correct but then part **(ii)** shows no working and an incorrect answer. The candidate recovers with a correct answer for the final part **(iii)**.

Example candidate response – grade E

(i) a two's complement binary number:

> That means it is the negative integer of the integer upon which we applied twos compliment. [1]

(ii) a sign and magnitude binary number:

> This also means that the actual integer m was positive and the first digit has been changed in order to make it negative. [1]

(iii) a binary coded decimal number.

> It is a fractional number converted into Binary language. [2]

Examiner comment

A grade E candidate might struggle with the conversion of two's complement numbers for **(ii)**.

Note, this candidate has completely misread the question – were they confused by the term 'data dictionary' ? – and has given an explanation, not performed the conversions.

The BCD conversion is more straightforward but we can only assume the candidate has again completely misunderstood what is required.

Question 8 (a)

(i) Explain the difference between static and dynamic implementation of data structures.

(ii) Give **one** advantage and **one** disadvantage of storing a queue in an array rather than in a linked list.

Mark scheme

(i) -A dynamic data structure changes size // A static data structure has the same size

-dynamic data structure matches size to data requirements // static data structure takes no account of data requirements

-dynamic data structure takes memory from heap as required

-static data structure is predefined at compile time [2]

(ii) *Advantage:*

-Array is of fixed size which simplifies algorithms // or by example e.g. retrieval of data

-Array controls the maximum size of the queue

Disadvantage:

-Queue held in an array cannot expand beyond the size of the array

-If queue is small then memory space is wasted. [2]

Example candidate response – grade A

(i) Explain the difference between static and dynamic implementation of data structures.

· In a static data structure the size is fixed and decided by the program while in a dynamic structure the size is variable and constantly changes [2] during execution.

(ii) Give one advantage and one disadvantage of storing a queue in an array rather than in a linked list.

Advantage The array allows random access so it is easy to access both head and tail

Disadvantage There may not be enough space to store the queue. Array may [2] become full.

Examiner comment

Part **(i)** – A well-expressed answer with the detail that this is an issue at runtime.

Part **(ii)** – A good example where the second mark is little more than the 'common sense' consequence of using an array.

Example candidate response – grade C

(i) Explain the difference between static and dynamic implementation of data structures.

In dynamic data structure the size of the structure may increase or decrease during excecation. But Static data structure the size doesn't change. [2]

(ii) Give one advantage and one disadvantage of storing a queue in an array rather than in a linked list.

Advantage Any overflows can be detected.

Disadvantage Memory can get wasted or . [2]

Examiner comment

Part **(i)** – The candidate expresses the idea of a static structure using a fixed amount of memory space, but cannot expand on this for the second mark.

Part **(ii)** – The candidate has come up with a disadvantage but is unable to suggest an advantage.

Example candidate response – grade E

(i) Explain the difference between static and dynamic implementation of data structures.

In static implementation once data has be
(implemented)
executed no change can be made to it while
in dynamic data can be manipulated even
after implementation. [2]

(ii) Give one advantage and one disadvantage of storing a queue in an array rather than in a linked list.

Advantage *Deleting of data can easily be retrieved
even from the back and wastage of space is limited with*

Disadvantage *Deleting of a data involve deleting
all the data before the intended one.* [2]

Examiner comment

Part **(i)** – The candidate is confusing actual changes to data values with the need to have a flexible amount of storage space.

Part **(ii)** – The answer that "data can easily be retrieved" from an array is a weak answer.

Question 8 (b)

(i) Draw a diagram to show how the following members of a Computing class can be stored in a linked list in alphabetic order:

<p style="text-align:center">FRO,   TSI,   DON,   ROS,   BEV</p>

(ii) Describe an algorithm to insert a new member of the class into the correct position in the list.

Mark scheme

(i) Either:

Start
FreeSpace
BEV → DON → FRO → ROS → TSI →|
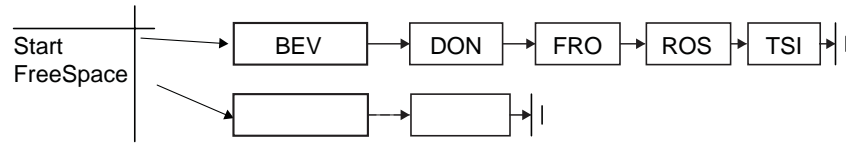
Start: 5	1	FRO	4
NFree: 6	2	TSI	X
	3	DON	1
	4	ROS	2
	5	BEV	3
	6		

Start: 4	0	FRO	3
NFree: 5	1	TSI	X
	2	DON	0
	3	ROS	1
	4	BEV	2
	5		

Mark as follows ...
-Start pointer + some value/arrows
-All values included
-Null pointer
-Indication of free space

Diagram in arrival order
-in arrival order
-with correct pointers

OR

Diagram in alphabetical order
-with correct pointers

OR

Array diagram
-in arrival order
-correct pointers
(1 per -, max 5)   [5]

(ii) -Input NewItem

-Store NewItem in next free space
-Set Current to value at Start
-Read values in list following pointers.
-until Current value in list > NewItem
-Pointer of Previous points to NewItem
-NewItem points to Current
-update free space list
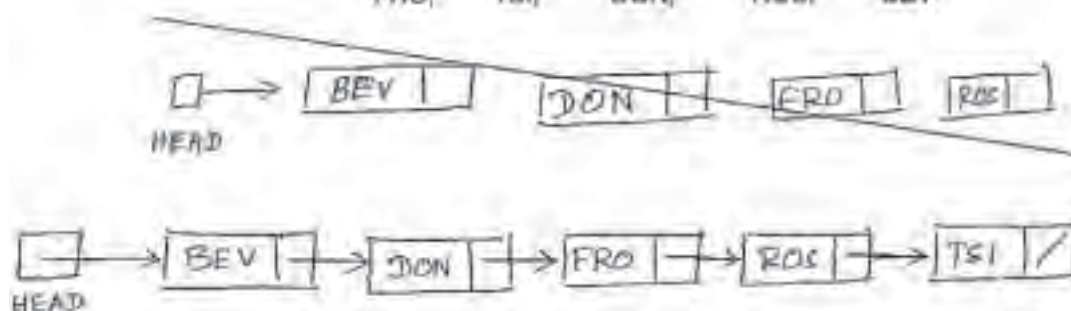-Mention of any special cases e.g. NewItem being First in list // list empty // list full // no free space

(1 per -, max 5)   [5]

Example candidate response – grade A

(b) (i) Draw a diagram to show how the following members of a Computing class can be stored in a linked list in alphabetic order:

FRO,   TSI,   DON,   ROS,   BEV

(ii) Describe an algorithm to insert a new member of the class into the correct position in the list.

- Check whether the FREE list (list of free data spaces) is empty, and if so, report an error and exit.
- ~~Set~~ Insert new ~~data~~ Member to location pointed to by FREE (head pointer of the FREE list & which points to free location)
- set ~~to~~ TEMP to FREE (TEMP ⇒ temporary pointer)
- Set FREE to the pointer in cell pointed to, by TEMP (to remove cell with new ~~to~~ member from the FREE List).
- Starting from HEAD, follow pointers until the cell immediately before new data item is found, and ~~(Eg: If new member to GUV, then call this~~ PREVIOUS. (Eg: If new member is GUV, then PREVIOUS is FRO)   [5]
- If PREVIOUS = HEAD, then set pointer in cell with new member to HEAD; set HEAD to TEMP and exit.
- If pointer in PREVIOUS = NULL, then set pointer in PREVIOUS to TEMP; set pointer in cell with new member to NULL and exit.
- Set pointer in ~~cell pointed to by PREVIOUS~~ the cell with new member to pointer in PREVIOUS
- Set pointer in PREVIOUS to TEMP and exit.

Examiner comment

Part **(i)** – A clear diagram which illustrates almost all the key points about the linked list – values in order, start pointer, links shown and there is an end-of list pointer. The candidate has not indicated there would need to be a pool of 'free space' from which the next new value would be allocated to a location.

Part **(ii)** – The standard of answers for this question was particularly poor and this answer was a rare example of a candidate who was able to describe the algorithm. They have the idea of needing to check for any special cases and the use of identifier names – FREE, NEXT, PREVIOUS and HEAD – to refer to particular nodes.

Example candidate response – grade C

(i) Draw a diagram to show how the following members of a Computing class can be stored in a linked list in alphabetic order:

FRO,   TSI,   DON,   ROS,   BEV
 3   5   2   4   1
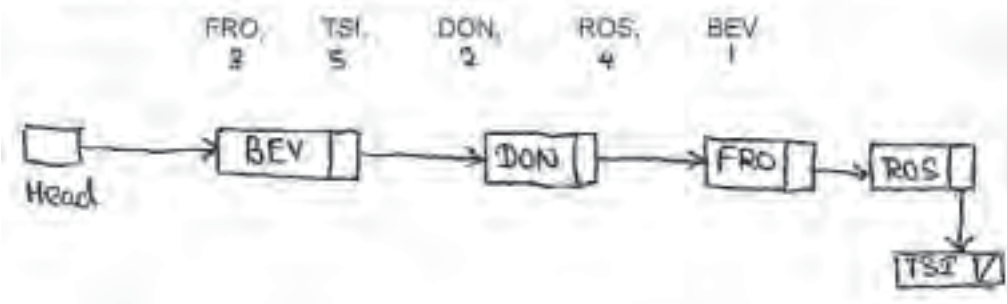
(II) Describe an algorithm to insert a new member of the class into the correct position in the list.

If List empty, report an error & Stop.
Compare the new member with members in the list. & hLet the pointer of the cell less than the new value of POINTER. Insert the data item into the cell pointed by the FREF. Remove this pointer, & join it to the cell pointed by the pointer of data added. Remove the pointer POINTER & connect it to the cell where the new data item is data added & join it to the ee set a pointer for the new cell & the cell with higher value.   [5]

eg -
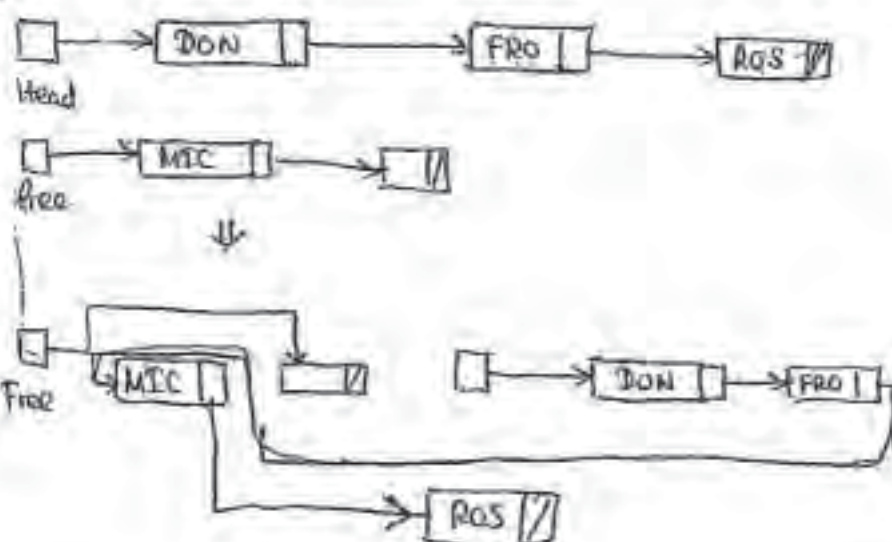
Examiner comment

Part **(i)** – A grade C candidate should score well on this question. The solution shows the nodes linked together in order with a clear start pointer and end-of-list pointer. However, the diagram makes no reference to a list of available free space.

Part **(ii)** – The final value in the list has been shown pointing to another node which is incorrect and there is no indication of the use of a 'free space' pool of locations. Start pointer and ordering of the nodes are correctly shown.

Example candidate response – grade E

(i) Draw a diagram to show how the following members of a Computing class can be stored in a linked list in alphabetic order:
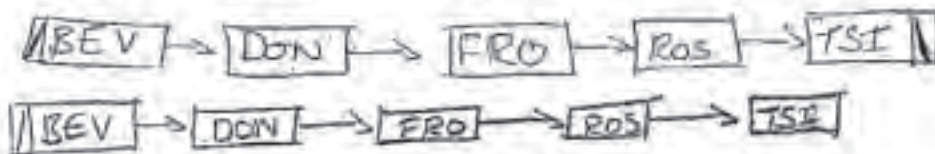
FRO,   TSI,   DON,   ROS,   BEV

FRO ls ~~one~~ ≤ TSI, so it is ignored.
FRO ls > Don, so DON is compared.
DON is < Ros, so it is ignored.
DON is > BEV, so BEV is head.

(ii) Describe an algorithm to insert a new member of the class into the correct position in the list.

→ Insert data to one free list cell
→ Remove head Pointer from free list cell
→ Compare data to data in linked list
→ find correct position.
→ remove head Pointer of Previous cell
→ Link head Pointer to new data cell
→ ~~remove but~~ connect null Pointer to next cell.

Examiner comment

Part **(i)** – Some key concepts such as a start pointer and 'end of list pointer' are not present in this answer.

Part **(ii)** – The answer reads an algorithm but there is only one correct step included – adding the new value to a free location.

Question 9

(a) Explain the need for reverse Polish notation.

(b) Show, with the aid of diagrams, how a stack is used to turn the reverse Polish expression

ab+cde-*-

into an expression in infix notation.

Mark scheme

(a) -reverse Polish expressions can be processed directly from left to right

-Is free of ambiguities

-does not require brackets

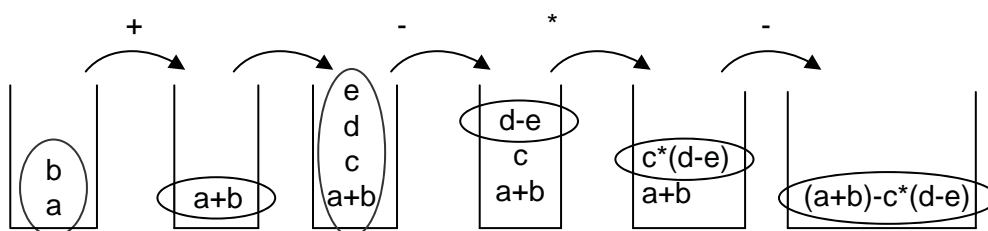-does not require use of rules of precedence

(1 per -, max 2)   [2]

(b)

Mark points:

-at least two operators shown between transitions

-a and b in first stage

-a+b after first operator

-e,d,c, (a+b) in stack in correct order

-(d-e)

-c*(d-e)

-(a+b)-c*(d-e)

(1 per -, max 6)   [6]
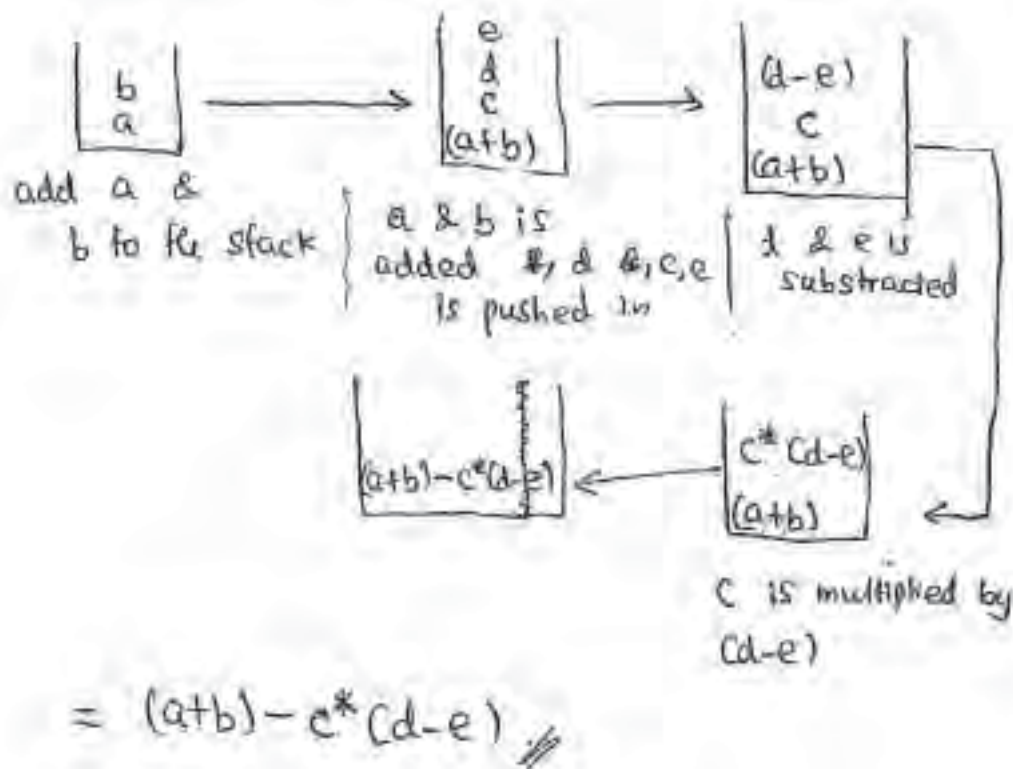
Example candidate response – grade A

(a) Explain the need for reverse Polish notation.

It is easy ~~easy~~ method of using arithmatic symbols by & operation can be carried by pushing the values to the ^{a} stack. So there is no ambiguilty of of the large expression to the [2] Computer system.

(b) Show, with the aid of diagrams, how a stack is used to turn the reverse Polish expression

ab+cde-*-

Into an expression in infix notation.

add a & b to the stack

a & b is added #, & d &, c, e is pushed in

d & e substracted

c is multiplied by (d-e)

= (a+b) - c* (d-e)

[6]

Examiner comment

Part **(a)** – Only one reason given – A grade A candidate could be expected to know that infix does not require the use of brackets (for the second mark).

Part **(b)** – This resourceful candidate realised this is best illustrated by drawing a number of stacks with the changing contents. The candidate has omitted to show the operator which causes each change to happen.

Example candidate response – grade C

(a) Explain the need for reverse Polish notation.

- Used to execute data simultaneously
- Because brackets
- Re Eliminate redundancy

[2]

(b) Show, with the aid of diagrams, how a stack is used to turn the reverse Polish expression

ab+cde-*-

into an expression in infix notation.

Input	Memory	Comments:
a	a	Push a
b	b a	Push b
+	(a+b)	Pop (a+b)
c	(a+b) c	Push c
d	c (a+b) d	Push d
e	e d c (a+b)	Push e
	(cd-e)	
-	(a+b)	Pop (cd-e)
×	c+ (c-d) xe (a+b)	Pop(c-d)xe
-	(a+b)-(c-d)xe	Pop (a+b)-(c-d)xe

[6]

$$= (a+b) - (c-d) \times e$$

Examiner comment

Part **(a)** – This candidate has remembered infix does not require the use of brackets but cannot give a second reason. The other two statements are clearly not relevant.

Part **(b)** – The candidate has the basic idea of a new row to show how the stack's contents change. Unusually this answer has the first position of the stack at the top (which is fine …) – most candidates drew the stack with the first value at the bottom. The start of this answer is accurate, but then errors are introduced. Candidate has omitted to illustrate what operator causes each change.

Example candidate response – grade E

9 (a) Explain the need for reverse Polish notation:

> So that the computer can do the arithmatic with the numbers easily. (computer can understand the arithmatic operations).

[2]

(b) Show, with the aid of diagrams, how a stack is used to turn the reverse Polish expression

ab+cde-*-

into an expression in infix notation.

$a+b-(c+(d-e))$

$(a+b)$
$(a+b)-(c+(d-e))$

[6]

(stacks – last in first out)

Examiner comment

Part **(a)** – This answer is merely stating the obvious and not worthy of a mark.

Part **(b)** – The candidate has no idea how to document the changing stack contents but has written the final infix which does score one of the available marks.

Question 10

A country has a national football competition based on leagues.
Each LEAGUE has a number of TEAMs but each TEAM is only in one LEAGUE.
Each TEAM plays at a number of GROUNDs during the season and each GROUND will host a number of TEAMs during the season.

(i) State the relationship between LEAGUE and TEAM.

Draw the entity-relationship (E-R) diagram to show this relationship.
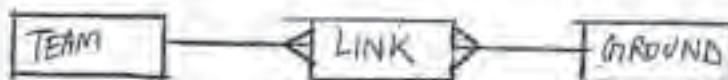
(ii) State the relationship between TEAM and GROUND.

Draw the E-R diagram to show this relationship.

(iii) Explain how the relationship between TEAM and GROUND can be designed in third normal form.

Mark scheme

(i) One to many   LEAGUE ——⟨ TEAM   [2]

(ii) Many to many   TEAM ⟩——⟨ GROUND   [2]

(iii) -Link table needed...

-with primary key made up of combination of primary keys of TEAM and GROUND

-Primary keys of TEAM and GROUND used as foreign keys in link table

-This turns the many to many relationship into..// a many-to-many relationship can not be implemented

-One-to-many and many-to-one/ 2x one-to-many relationships

(1 per -, max 4)   [4]

Example candidate response – grade A

(i) State the relationship between LEAGUE and TEAM.

One to Many

Draw the entity-relationship (E-R) diagram to show this relationship.

LEAGUE ◁— TEAM

[2]

(ii) State the relationship between TEAM and GROUND.

Many to Many

Draw the E-R diagram to show this relationship.

TEAM ⊳—◁ GROUND

[2]

(iii) Explain how the relationship between TEAM and GROUND can be designed in third normal form.

In third normal form, a many to many relationship cannot exist. A further entity needs to be used to link the two entities TEAM and GROUND. TEAM will have a one to many relation with the LINK. GROUND will also have a one to many relation with the link. The diagram of the relation between TEAM and GROUND in third normal form has been given below.

TEAM ◁— LINK ⊳— GROUND

[4]

Examiner comment

Part **(i)** – Correct statement and drawing of the relationship.

Part **(ii)** – Correct statement and drawing of the relationship.

Part **(iii)** – A clear answer with the key points made in a logical order and illustrated by the new diagram. The candidate has failed to explain how these new relationships will be formed – i.e. by the use of foreign keys in the new third table.
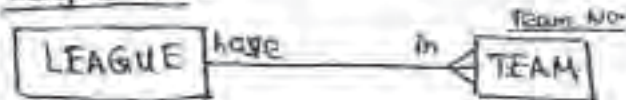
Example candidate response – grade C

(i) State the relationship between LEAGUE and TEAM.

~~Man~~ Many ~~to one~~ one to Many.

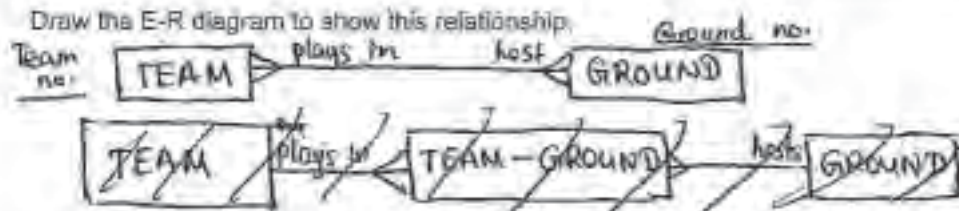Draw the entity-relationship (E-R) diagram to show this relationship.

League code.

LEAGUE —have— in— TEAM   Team No.

[2]

(ii) State the relationship between TEAM and GROUND.

Many to Many.

Draw the E-R diagram to show this relationship.

Team no. TEAM —plays in— host— GROUND   Ground no.

TEAM —plays in— TEAM – GROUND —host— GROUND

[2]

(iii) Explain how the relationship between TEAM and GROUND can be designed in third normal form.

~~First~~ There should not be any repeating fields in the tables. The ~~non-key attribute should~~ So its in 1st normal form. The non-primary key attributes should be fully dependent to the primary keys. (2nd normal form). In 3rd normal form the non-key attributes should not have interdependencies. ~~At~~ ~~edd~~ last an addition table is prepared to store the primary key of the TEAM & ground is that it can be used to link the tables in 3rd normal form.

[4]

Examiner comment

Part **(i)** – A grade C candidate should be able to draw on their practical work with a relational database and produce a correct statement and diagram of the relationship.

Part **(ii)** – Correct statement and drawing of the relationship.

Part **(iii)** – The candidate has initially written several general statements which do not score – then finally describes what will need to happen for this scenario – that there is a third table which needs to include the primary key attributes of TEAM and GROUND.

Example candidate response – grade E

(i) State the relationship between LEAGUE and TEAM.

.... ~~one~~ ~~about~~ to many relationship ....

Draw the entity-relationship (E-R) diagram to show this relationship.

[2]
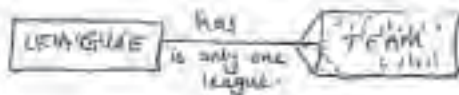
(ii) State the relationship between TEAM and GROUND.

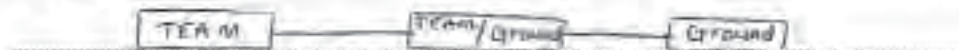..................... ~~one~~ many to many relationship ....

Draw the E-R diagram to show this relationship.
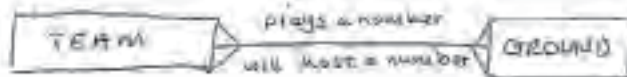
[2]

(iii) Explain how the relationship between TEAM and GROUND can be designed in third normal form.

~~The~~ In the first box, there will consist of TEAM, then in the middle, it will consist of both the TEAM and GROUND; finally, in the last box, it will consist of column; All the boxes will link to each other like in the above diagram.

[4]

Examiner comment

Part **(i)** – A grade E candidate should be able to draw on their practical work with a relational database and produce a correct statement and diagram of the relationship and so score full marks.

Part **(ii)** – As above for **(i)**.

Part **(iii)** – The candidate has worked out a third entity will be required but the detail is wrong including crucially the new relationships needed. This is a weak answer for part **(iii)**.

Question 11 (a)

Describe the differences between interpretation and compilation of a high-level language program.

Mark scheme

-Interpreter translates one instruction, runs it before going on to the next // Compiler translates all the instructions before run.
-Compiler creates object code/executable file // Interpreter does not
-Interpreter makes for easier debugging
-Compiled programs will execute faster // interpreted code will execute slower
-Interpreter must be present to run the program // compiler not needed at runtime
-Interpreter will translate code in loops more than once // Compiler only once
-once compiled no further translation needed // every program execution requires interpreter
(1 per -, max 3)   [3]

Example candidate response – grade A

During Interpretation, each lines is translated and executed before translating the next lines a separate file object code is not made, so source code is needed when executing the program each time. During compilation the whole program is translated in one go, and a separate object-code file is created, so that source code is not needed afterwards. [3]

Examiner comment

A good explanation of the differences between using a compiler and interpreter. This is a strong answer – the candidate appreciates that the interpretation process does not produce object code (one of the more subtle points available on the mark scheme).

Example candidate response – grade C

- Interpretation includes translation of every instruction, turn by turn and errors can be pointed easily where as,
- During compilation translation is done as a whole and errors are difficult to pin point
[3]

Examiner comment

This question is knowledge recall only and this is a weak answer. The statement about errors being difficult to locate for a compiler is weak – a stronger answer would have been that an interpreter provides for better diagnostic features with an explanation.

Example candidate response – grade E

When interpretation is used, it the high level language is translated into low level language and executed by taking one instruction at a time. the next instruction is not translated until the previous is executed. In compilation the whole program is translated and executed. compilation needs more memory then interpretation [3]

Examiner comment

A weak answer – the description of an interpreter is good and follows on stating how it is different from a compiler. Well-constructed sentences.

Question 11 (b)

When a program is run the processor uses special purpose registers.
Describe how the contents of each of the following registers changes during the fetch-execute cycle:

(i) Memory Address Register (MAR)

(ii) Memory Data Register (MDR)

Mark scheme

(i) -Contents copied from PC
-Contents changed to the operand/address part of CIR   [2]

(ii) -Instruction copied <u>from memory/location</u> to MDR when contents of MAR are from PC
-Data copied <u>from memory/location</u> to MDR when instruction is LOAD
-Data copied <u>from ALU/Accumulator</u> to MDR when instruction is STORE   [max 2]

Example candidate response – grade A

(I) Memory Address Register (MAR)

• Each time the PC (program counter) is incremented, the address is copied to MAR to fetch the instruction on that address. When a jump instruction occurs, its value, copied to PC, ie copied to MAR. [2]

(II) Memory Data Register (MDR)

   and instructions

• Data fetched from memory & are copied to MDR to be sent to Accumulator or CIR as necessary.

• When data need to be sent from accumulator to
                   MDR
main memory, it is copied to ~~MAR~~ to be sent [2]
to memory.

Examiner comment

Part **(i)** – The candidate is able to describe the use of the PC at the fetch stage and also later for certain instructions once the instruction has been decoded.

Part **(ii)** – The candidate understands that values are copied from memory and that later a value will be used from the Accumulator (or ALU would have been better).

Example candidate response – grade C

(i) Memory Address Register (MAR)

– Holds the address of the instruction, that is to be fetched from memory
– when the ~~latent~~ content of PC changes, MAR changes to the same value (ie – address) [2]

(ii) Memory Data Register (MDR)

– holds the data to be transferred to and from memory.
– for instructions on their way to CIR-
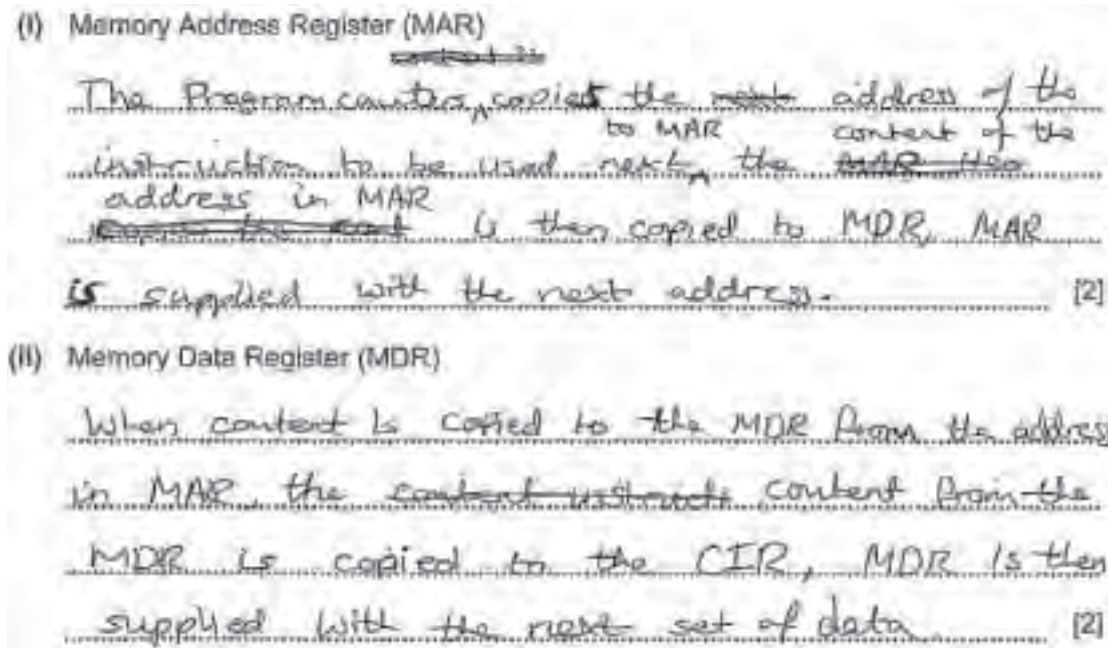– when MAR changes, is loaded with instruction. in MAR's address. [2]

Examiner comment

Part **(i)** – The candidate appreciates that the contents are copied from the PC but does not suggest that – for a 'LOAD' or 'STORE' instruction – the contents of the PC will change as a memory cell has to be referenced.

Part **(ii)** – The answer suggests that values are obtained from main memory. The candidate does appreciate that the MDR will also be used following the decode of a 'STORE' instruction.

Example candidate response – grade E

(I) Memory Address Register (MAR)

~~content is~~

The Program counter copies the ~~next~~ address of the
to MAR   content of the
instruction to be used next, the ~~MAR Has~~
address in MAR
~~copies the cont~~ is then copied to MDR, MAR
is supplied with the next address.   [2]

(II) Memory Data Register (MDR)

When content is copied to the MDR from the address
in MAR, the ~~content is/stored~~ content from the
MDR is copied to the CIR, MDR is then
supplied with the next set of data   [2]

Examiner comment

Part **(i)** – A weak candidate should realise that the initial use of the MAR is to copy the contents of the PC. The use also of the MAR for certain instructions after the decode is a difficult concept for this candidate.

Part **(ii)** – There is an easy mark available here for describing that the value will come from main memory. The first sentence suggests that the candidate understands what is happening but omits the key words 'from memory'.

Question 12

A business uses the Internet to communicate with suppliers and to pay bills electronically.
Discuss the problems of maintaining confidentiality of data on the Internet and techniques that can be used to address these problems.

Mark scheme

-Must safeguard against unauthorised access to the computer system

-Firewall used to restrict access to known sources

-Control access to the network using accounts/user IDs with passwords // procedures in place for authentication

-File contents can be encrypted

-procedures in place to protect against malware

-all payments/communication can be made through a secure connection

-need to safeguard against bogus websites

-Procedures in place for authorisation of resources

-Users allocated access rights to various resources // users have access to certain files/folders only

-Files can be password protected / read-only

-users can access the network from certain terminals only / certain times of the day only

-use of digital signatures

(1 per -, max 6)   [6]

Example candidate response – grade A

Examiner comment

A good 'discussion' – as asked by the question stem – with five suggested techniques to address the issues.

Example candidate response – grade C

Internet is a network of networks so it is possible for for any user to 'tap' the data to corrupt them. This can happen accidentally or deliberately. So the data transfer via the network *(internet)* is unreliable. So when data is transfered the data is encrypted &, so even though the data is hacked it won't be sensible & changes done will be detected at the receivers end. Because only the receiver has the encryption key for the encrypted data. A specially type of encryption called Secure Socket layer (SSL) can also be used. Firewalls as are used to prevent any neccessary data [6] or users entering the network server or any data confidential data going out of the server.

Examiner comment

A clear attempt at a question which started with the keyword 'Discuss' and three relevant solutions described.

Example candidate response – grade E

The internet is accessible to allmost everyone so it is very possible that someone my try to hack your system and steal some confidential data of the your business. and its your customers. There are many techniques that can be used to make the data more secure. First we can use passwords to hide confidential data. Firewalls are to keep hackers out. Give out prioritys, like make the data read only for certain users obtain the data in packets, rather than in switches scan the data to see if its a bug or a virus.

(6)

Examiner comment

On an opened-ended question like this a grade E candidate should score reasonably well (the mark scheme had 12 different points from which the six available marks could be scored). The answers here are weak with little explanation of the three security measures given.

Paper 4: Computing project

What is the project?

The project is a substantial piece of work requiring analysis and design over an extended period of time, which is organised, evaluated and presented in a word processed report.

Students choose, in conjunction with their teacher, a well-defined user-driven problem which enables them to demonstrate their skills in analysis, design and software development, including programming, testing, installation, documentation and evaluation. Problems should be selected that allow students to demonstrate their programming skills.

Projects should be chosen to demonstrate the integrative aspects of the work and should avoid needless repetition of the demonstration of a given skill. Each student must submit a report on their piece of work, supported by evidence of software development including programming and testing.

The teacher marks the projects using the marking criteria in the Guidance on Marking Projects section of the syllabus, then moderation takes place.

The selection of the problem for which a computerised system is to be designed and implemented is extremely important. It should be chosen by the student in consultation with the teacher, and should always involve a client, who requires the solution to the problem, and a user(s), the person who is going to use the computerised system. The client and the user may be the same person e.g. if a sole-trader's business requires a computerised system.

It is important to stress that the student should endeavour to produce a system which will solve a given problem sensibly, within the constraints of resources available to the student.

Since the computing project seeks to assess the systems analysis section of the specification in a practical manner, students should not produce a system from their own limited knowledge of the requirements of the system. The client has to be someone who is willing to be involved in the project:

- in the analysis of the problem, where the client's requirements are obtained; this may take the form of recorded interviews with the student
- at the software development, testing and implementation stages, where the client and/or user is involved in 'prototyping'
- at the evaluation stage, where the client is involved in checking that the system is completed as specified and, leading on from this, is then willing to write a letter of acceptance of the system, including any criticisms of it.

In this way, students can be encouraged to look beyond school or college life into the businesses and companies in the community of the surrounding area. The emphasis is on analysing an existing system, and producing a computer-based solution to fit the needs of a client.

At the end of the project, students should submit a concisely written and well laid out report, which should be word-processed.

The solution must be implemented using a programming language and any of the following that are appropriate:

- pre-written modules or toolkits
- applications software and programmable packages

Very brief descriptions of any programming languages or software packages used, together with reasons for their selection, should be included in the report.

Choosing a suitable project

Students may choose to solve their problems by either the use of a software applications package and/or by writing their own program(s). The exact method of solution will be the choice of each student but the teacher will need to ensure that all options have been covered during the course so as to allow the student maximum flexibility in their choice of solutions. The use of a specific programming language is the responsibility of the school and will be determined by the available resources within the school. However if students choose to write their own program then the choice of language must allow them to construct their program in a structured modular approach. Previous experience of students' work indicates that the choice of certain projects, for example games, quizzes, word processing and websites that just provide information, make unsuitable projects and are not capable of achieving high marks unless they are both very well designed and clearly documented.

The following list is offered as a suggestion of some suitable projects but it is in no way complete and students should be actively encouraged to investigate.

- Booking systems e.g. Doctor's/Dentist's/Hospital appointments, Leisure centre facilities, beauty salons etc.
- Ordering and stock control
- Borrowing systems e.g. Libraries, DVD rental
- Seat reservation systems for theatres, cinemas, concerts etc.
- Control systems e.g. greenhouses, air conditioning, lifts, traffic lights etc.
- Management of club memberships
- Management of events e.g. School sports day

Centres should be reminded that the project should be the **student's own work** and so joint projects should not be allowed.

Successful projects usually involve the use of a database management system (DBMS) that supports the use of a programming language. Database projects allow the students to achieve at different levels; the weaker students may only be able to use the tools provided by the DBMS including validation techniques to check the input data, use of primary and secondary sorts, use of QBE to create multi-table queries, and the use of forms and reports. As the weaker students progress through their solution it should be possible to extend the work gradually so that they can include a range of these techniques. All students should include some program code that they have written and developed themselves, in order to demonstrate their ability to write a maintainable routine for a program. Better students could make good use of the data description language (DDL) and data manipulation language (DML) provided linking to the work studied for Paper 3.

Other types of project could be developed making use of the programming language that the student studied for Paper 2. These could include control systems, simulations etc.

The use of the Internet for business, educational and recreational purposes has led to an increase in the number of projects involving the design of websites. At its basic level this type of project is often not well documented by the weaker students and so does not score highly. We would expect to see the HTML code for such a project together with a site map and links to external sites. The solution could be extended to include an email facility, use of forms and links to a database to collect user information. In the case of web design the current solution to the problem may be harder to identify and so the student may find it more difficult to score marks in those sections relating to the investigation of the current solution.

Guidance on marking the computing project

Computing projects are assessed as follows:

Quality of report	3 marks
Definition, investigation and analysis	11 marks
Design	12 marks
Software development, programming, testing and installation	18 marks
Documentation	10 marks
Evaluation	6 marks
Total	**60 marks**

Teachers should mark their students' projects using the following sub-sections and record their marks for each individual project on the marking grid (pages 48–51 of the syllabus) and any comments that may be helpful to the moderator e.g. identification of missing items, page references for items.

Example candidate responses

For each section of the report marked extracts from candidates work are included, together with a completed section of the marking grid showing the teacher comments and examiner comments.

The extracts are from a wide range of projects including:

- Sports Day
- Flat Management
- Garden Centre
- Bridal Shop
- Pupil Records
- Library System

(a) Quality of report (3 marks)

A candidate should produce a well-ordered report that covers all the information from the sections set out below. The report must be the student's own work and any evidence that has been included from elsewhere, including other students' work, must be properly referenced as such and cannot be credited towards the student's mark for that section. For full marks to be awarded for this section, the student must provide clear well-illustrated evidence for all the given sections of the report.

Also, the text must be understandable to the reader and without obvious mistakes in spelling, punctuation and grammar. Where there are two or more recognised spellings for a word, the student should be consistent throughout in their choice of spelling.

Example candidate response

Contents

Marks awarded

(a) Quality of report			**[_2__/3 marks]**
(a) Quality of report		Mark	Comments
1	Evidence for most sections is included; there may be errors of spelling, punctuation and grammar.		Teacher comment – none Examiner comment – an excellent well-ordered report but some errors of spelling punctuation and grammar.
2	Evidence for all sections is included, the report is well ordered, and there are few errors of spelling, punctuation and grammar.	2	
3	The report is complete, well organised with good use of illustrations, and there may be a few minor errors of spelling, punctuation and grammar.		

Examiner comment

Although this is the first section of the report the examiner would check this mark after they have looked through the whole report. However, inclusion of a contents page is good practice and can help to show the organisation of the report.

The contents page set out below provides some evidence for the mark awarded by the teacher as it is clearly set out and well organised.

(b) Definition, investigation and analysis (11 marks)

(i) Definition – nature of the problem (3 marks)

A candidate should not expect the examiners to be familiar with the theory and practice in the area of the chosen system. There should be a brief description of the organisation (for example, firm or business) involved and the current methods used in the chosen areas that may form the basis of the project. A clear statement of the origins and form of data should be given. At this stage the exact scope of the project may not be known and it may lead to the arranging of an interview with the client.

Example candidate response – Bridal Shop

System definition

Introduction

This report presents details of a computer system that was created with aim of calculating cost of services given to customers that visit C… Bridal shop and also to keep records of customers and the services they order for.

Background of the study

C… Bridal shop designs people that are going to be involved in parties like weddings. Whenever the customers report, they choose and pay for specific body design services they need in preparation for ceremonies. However most of the records of customers are kept by the cashier using manual receipt books hence making it very difficult for the shop administrator (manager) to access records of sales made.

In order to calculate money customers must pay for the services they order, the cashier uses a calculator to add up the costs of all services the customer received.

This project is aimed at creating a computer system that will be used by the cashier to record down all services rendered to customers and also to automatically calculate cost of the services the customers received. It will also issue a receipt to a customer.

PROBLEM STATEMENT

Whenever the customers visit the shop, they choose specific services they need. In order to calculate money customers must pay for the rendered services, the cashier uses a calculator to add up the total cost of all services the customer received and also, the cashier writes down customer payments and orders in a paper receipt book.

At the end of the day, in case the shop administrator (manager) wants to review sales made per a day, he refers to the receipt book while opening all receipt sheets in the receipt book. The problem with this system is that, it makes it very difficult and slow for the manager to search for records. Another problem with using the calculator is that the cashier gets so tired while pressing calculator all the time and in situations where customers are so many the cashier ends up making mistakes in the figures he presses leading to inaccurate charges of customer orders hence, there was need of introducing a good system that calculates customer order charges accurately, keeps records efficiently for quick access and keeps records safely.

Marks awarded

(i) Definition – nature of the problem			[_2__/3 marks]
		Mark	Comments
1	Description of the organisation.		Teacher's comment – none made. Examiner comment – very brief description of organisation with an attempt to describe the methods currently in use, no clear description of the origin of data or the form that the data takes. Too much comment about the perceived difficulties, this type information would only be known after the investigation and analysis.
2	Description of the organisation and the methods currently used in the area of the chosen project.	2	
3	Full description of the organisation and methods currently in use in the area of the chosen project, with a description of the origin of the data to be used and some indication of the form that data takes.		

Example candidate response – Sports Day

Description of the organization:

The organization is a private international school formed in 1964 called M… School located in S… A… in the south of France; due to its ideal location close to both the Alps and sea. The teaching staff consists of 45 teachers in different departments, maths, sciences, and languages. There are currently 454 students in the school.

The school has a Library, 2 art studios, 3 science laboratories, Information Technology centre, music room and a performing arts hall, examinations room, as well as a synthetic football pitch and outdoor games court and a gymnasium. The students in form 11 take the IGCSE (International General Certificates in Education) examination and then go on into taking their Advanced International Programme, AS in form 12 and A-level in form 13.

Every year they organize a big sporting event where students compete against each other to score points for their houses. The students in form 5 to seniors (form 13) compete in the following events: triple jump, high and long jump, 100m, 200m, 300m 400m 800 and 1500 as well as javelin and shot putt. These events are split into age groups and gender to keep the competition fair. There are four houses blue, red, yellow and green. The house that has the most points wins the event.

Methods currently in use:

A computerized database contains the different houses with the students in each house separated in different forms. The information is printed from the database so that there is one sheet for each form. These sheets are used during the event to keep track of all the points scored by each individual student. The points are recorded manually during the course of the event on the corresponding sheet of paper. At the end of the event all of the points are then added up to have a total for each individual house.

Origin of the data:

The data comes from the events, the lengths or times are recorded and then the points are allocated depending on what position the student arrived in the event. After the event the student the students name and position is written on a result sheet and the number of points are allocated.

Form the data takes:

Once the student has done his event the data is then given to one of the teachers from the P.E department to then be written in the sheet of paper so you can see how many points each student has gotten and in what event. Then the points are added up to get the total number of points for each house. The final form for the data is then the numerical data on paper document. The samples are showed after the first interview since they were obtained then.

This is the sheet of paper which is used to fill in the results. It contains the fields to enter the name of students in the position that they arrive as well as a field to enter the number of points scored by the student.

EVENT		NAME	HSE	PTS		NAME	HSE	PTS		NAME	HSE	PTS		NAME	HSE	PTS
100 A	1				2				3				4			
B	1				2				3				4			
200 A	1				2				3				4			
B	1				2				3				4			
400 A	1				2				3				4			
B	1				2				3				4			
800	1				2				3				4			
	5				6				7				8			
1500	1				2				3				4			
	5				6				7				8			
LJ	1				2				3				4			
	5				6				7				8			
TJ	1				2				3				4			
	5				6				7				8			
HJ	1				2				3				4			
	5				6				7				8			
SHOT	1				2				3				4			
	5				6				7				8			
JAV	1				2				3				4			
	5				6				7				8			
RELAY	1				2				3				4			

Marks awarded

(i) Definition – nature of the problem			**[_3__/3 marks]**
		Mark	Comments
1	Description of the organisation.		Teacher comment - description of organisation, methods, origin of data and form data takes. Examiner comment – brief but covers all the points required.
2	Description of the organisation and the methods currently used in the area of the chosen project.		
3	Full description of the organisation and methods currently in use in the area of the chosen project, with a description of the origin of the data to be used and some indication of the form that data takes.	3	

(ii) Investigation and analysis (8 marks)

This section is the 'systems analysis'. The candidate should describe how the client requirements were ascertained (possibly by long discussions with the users: question and answer sessions should be recorded and outcomes agreed). A clear requirements specification should be defined. Alternative outline solutions should be discussed and evaluated against one another.

Example candidate response – Sports Day

Investigation:

To obtain information on the current system, how it works data inputs and outputs as well as knowing what the new system will need to do it was decided that key members of the staff who work with the system. Interviews will be conducted in order to obtain this information and discuss directly with them what it is they want the new system to do. Questions on the how the system works will be asked, what the system needs to do any current problems, the data used and any useful information relative to the system.

The first interview planned was to interview the head of the school's P.E department Mr F...

Below are the details of the interview - the questions asked and Mr F...'s responses.

Question 1: So as you know every year there is the sportsday event and you are in charge of the event?

Yes I am currently in charge of that sporting event as well as the current system used to record the scores of the events.

Question 2: The following questions will relate to the system's use before the actual event. Where is all the data, such as the students' names, forms and houses are stored? Where does all this data come from?

The data is stored in a spreadsheet on my laptop. All of this data actually comes from the school's database which keeps records of all the student's details. A copy of the database is then taken and the data is then extracted into the spreadsheet.

Question 3: Who is in charge of entering the data into the database and then transferring it into the spreadsheet?

The school's secretary is in charge of entering the data into the school database and I am the one who extracts the data from the schools database into the spreadsheet.

Question 4: What validations and verifications are used?

Once the data has been transferred from the database to the spreadsheet I look through the spreadsheet, I generally know which students are in which class, I also check that there isn't any missing information such as name or gender and check that the student is in the correct house.

Question 5: Where is the database stored?

The database is stored on the school server.

Question 6: How often is the database updated?

The database is updated at the start of every year and straight away when a new student joins. In October when the lists are given out so that the students can select what events they do then the members of staff quickly realize that a student is missing.

Question 7: What security methods are used?

I cannot tell you about the security used for the database, but for the spreadsheets which are on my laptop computer and is protected by a username and password which I or carry or lock away. Security isn't a concern - the students know the names of other students and the details are not of sensitive nature.

Question 8: Before sports day sheets of paper are printed so that the students can choose what event they do. Who is in charge of printing these and where are they kept after they have been filled in by the students?

I am in charge of printing out a sheet for each house, then all of the students are grouped in their houses and fill on the sheet the events they want to do. Once they have been filled in I keep them in the RE office in the sportsday folder.

Question 9: Is there any backup of this data made?

There is no copy of the paperwork (the sheets filled in by the student) but there are backups of the spreadsheets used

Question 10: During the event - How are the results recorded?

For the track field events it's fairly simple. For the throwing events the length is simply measured and then written down same for the jumps. For the track events a machine is used to time all of the students -then the teachers in charge of the results allocate the points.

Question 11: To whom does the information (number of points) go to?

The information is collected and then taken to the desk where 2 teachers fill in the results into a large grid and allocate the points to the different houses. At the end of the day the points are added to find the total for each house and the winner is announced the next day.

Question 12: What would you say are the main problems with the current system?

Well it takes time to accumulate the results, as well as checking any calculation errors in the addition of the points. Also since all of the results are kept on a large sheet of paper which is hard to store and it is difficult to find any individual results that need to be looked at.

Question 13: So what do you think the best thing to do to improve the system would be? Improving the manual system, a computerized or partially computerized system?

I believe that a partially computerized system would be the best option for this. Computerizing the whole system would be too expensive and not necessarily more efficient. The data will still be collected manually (events) but during the event the data will be directly recorded on a computer so that all of the addition of points is done automatically and it is a lot easier to find individual records as well as storing it.

Question 14: Off the shelf software is software that you can buy directly in a shop, have you looked if there is any software that could do that?

Yes I have looked into that, but there isn't any software that can provide exactly what we require so we need custom written software for this.

Question 15: Is there anyone else you would recommend me to talk to?

Yes I think you should talk to one of the 2 teachers who are in charge of recording the results and allocating the points to discuss with them what the problems are and the requirements that a computerized system would need to have to be the most effective. You might as well want to talk to one of the teachers who does the direct recording of the results at an event to see the problems there.

Below are copies of the event selection sheet and the result sheet

First Name	Last Name	Form	Gender	Houses	100	200	300	800	1500	HJ	LJ	shot	jav		Relay (4!)
A….	CL….	7	F	yellow											
A….	HO….	7	F	yellow											
A….	LI….	7	F	yellow											
E….	AB….	8	F	yellow											
A….	BA…..	8	F	yellow											
A….	BO….	8	F	yellow											
O….	MC….	8	F	yellow											
S….	SO…..	8	F	yellow											

First Name	Last Name	Form	Gender	Houses	80	150	600			HJ	LJ	ball throw			Relay (4!)
S….	AD….	5	F	yellow											
L….	NI….	5	F	yellow											
C….	BE….	6	F	yellow											
P….	KR….	6	F	yellow											
C…..	LO….	6	F	yellow											
N…	MA…	6	F	yellow											
E….	MU…..	6	F	yellow											

This is one of the sheets used to record the results and the number of points at sports day.

EVENT		NAME	HSE	PTS		NAME	HSE	PTS		NAME	HSE	PTS		NAME	HSE	PTS
100 A	1				2				3				4			
B	1				2				3				4			
200 A	1				2				3				4			
B	1				2				3				4			
400 A	1				2				3				4			
B	1				2				3				4			
800	1				2				3				4			
	5				6				7				8			
1500	1				2				3				4			
	5				6				7				8			
LJ	1				2				3				4			
	5				6				7				8			
TJ	1				2				3				4			
	5				6				7				8			
HJ	1				2				3				4			
	5				6				7				8			
SHOT	1				2				3				4			
	5				6				7				8			
JAV	1				2				3				4			
	5				6				7				8			
RELAY	1				2				3				4			

Interview 2 Mrs M…

Question 1: Can you please tell me what you do

I record the position of the students during the track events and sometimes record the time.

Question 2: So is there a teacher assigned to each position?

Well not really, there are usually 3 teachers that just take down the name of the student, position and his house. Each teacher is in charge of 2 or 3 lanes and records the name of the student, his position and house.

Question 3: So who does the timing?

Well Mr G… is in charge of the actual timing He uses a machine and clocks in all of the runners so he simply clocks in the times but not the positions. The machine then prints out a sheet with the times.

Question 4: What do you then do with those times?

I then with the help of another teacher assign the times to the position house and names so that we end up with a sheet for each age ground and gender.

Question 5: And what happens to the data?

The data is then taken to the desk where Mrs K… fills in the results onto a large sheet of paper (1 per age group and gender). She fills in the results and then adds up the number of points for each house, and writes down the number of points for each house in that age group on a separate piece of paper. She also checks if no new records have been broken and writes down any new records.

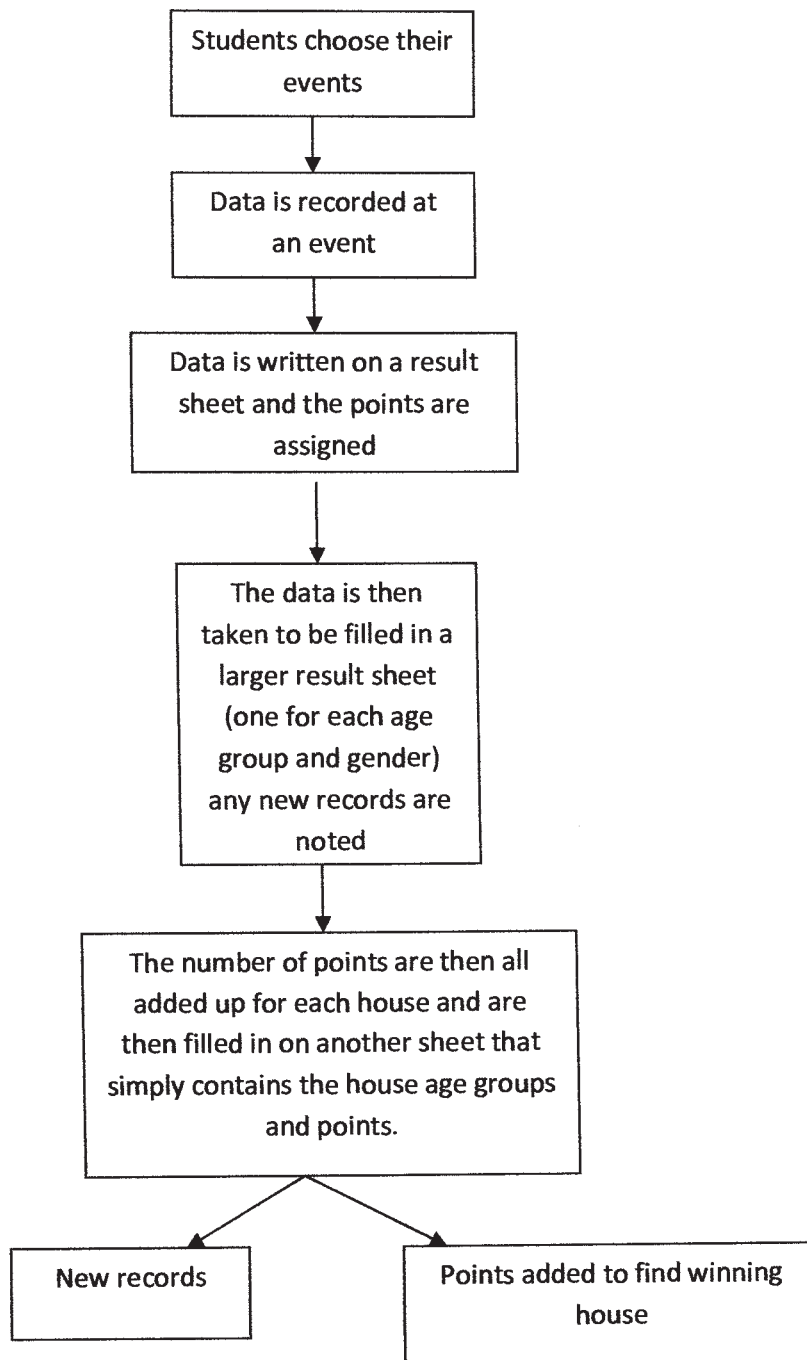Question 6: What are the main issues with filling in the results and allocating the points?

Well there really only is one problem consists in finding the 6 fastest times since there can be a lot of students taking part in an event. Another problem can be when the timing machine doesn't work where the teachers have to time the students. The rest is fairly easy and straightforward.

Question 7: If we were to partially computerize the system, what would need to be entered into the system for the results?
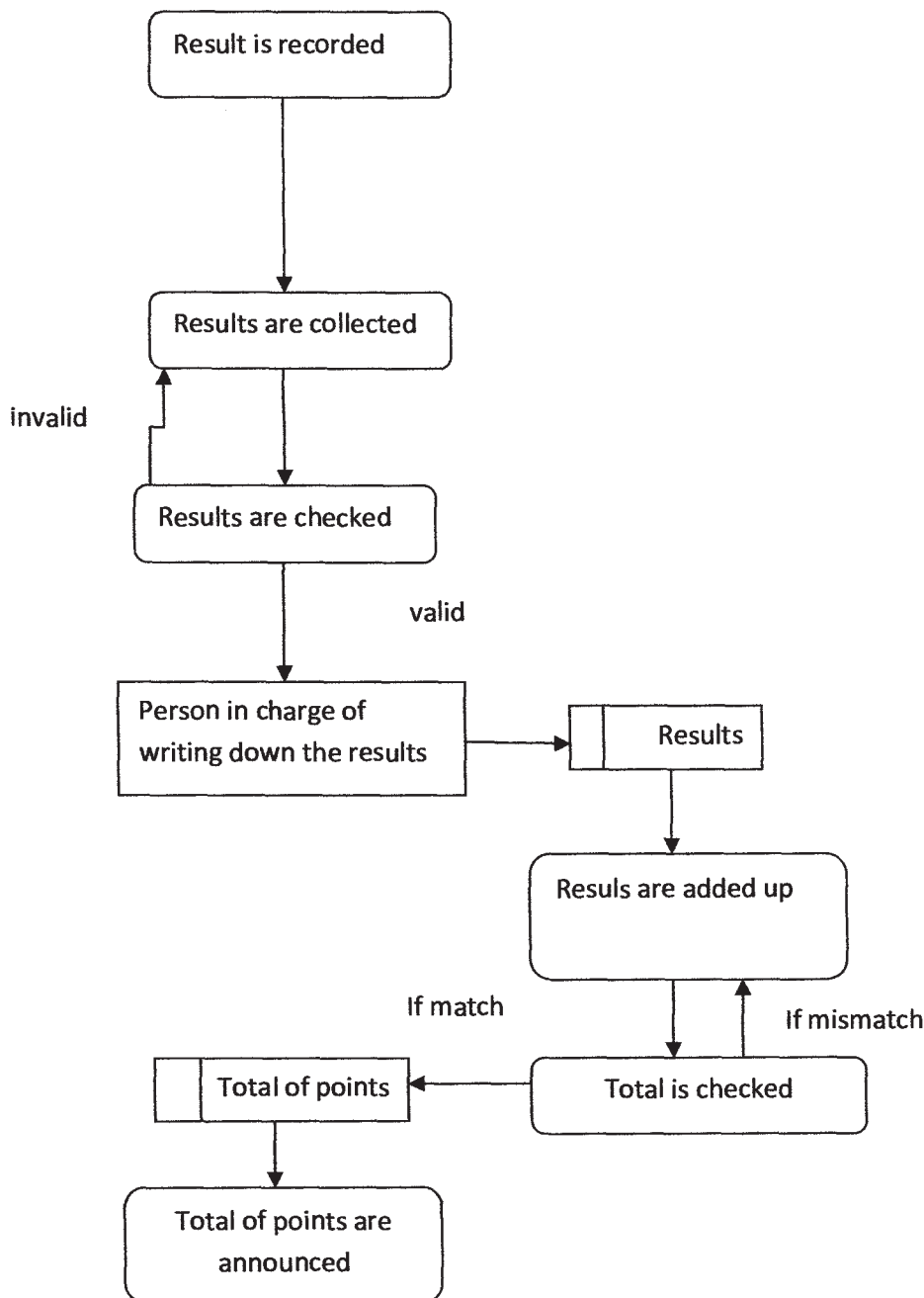
Well the interface must allow the input of everything required to enter the results. So that would be the Student ID, the position of the student in his event, the number of points scored and the time or length he or she achieved.

Analysis:

Flow chart showing the steps of the system:

```
        ┌─────────────────────┐
        │ Students choose their│
        │      events          │
        └──────────┬──────────┘
                   │
                   ▼
        ┌─────────────────────┐
        │  Data is recorded at │
        │      an event        │
        └──────────┬──────────┘
                   │
                   ▼
     ┌────────────────────────────┐
     │ Data is written on a result│
     │ sheet and the points are   │
     │         assigned           │
     └─────────────┬──────────────┘
                   │
                   ▼
        ┌─────────────────────┐
        │  The data is then    │
        │ taken to be filled in a│
        │  larger result sheet │
        │  (one for each age   │
        │  group and gender)   │
        │  any new records are │
        │        noted         │
        └──────────┬──────────┘
                   │
                   ▼
   ┌──────────────────────────────────┐
   │ The number of points are then all │
   │ added up for each house and are   │
   │ then filled in on another sheet that│
   │ simply contains the house age groups│
   │         and points.               │
   └───────┬──────────────────┬────────┘
           │                  │
           ▼                  ▼
   ┌──────────────┐   ┌─────────────────────────┐
   │ New records  │   │ Points added to find winning│
   │              │   │          house          │
   └──────────────┘   └─────────────────────────┘
```

Data flow diagram:

```
        ┌─────────────────────┐
        │  Result is recorded │
        └─────────────────────┘
                   │
                   ▼
        ┌─────────────────────┐
        │ Results are collected│◄──┐
        └─────────────────────┘   │ invalid
                   │               │
                   ▼               │
        ┌─────────────────────┐   │
        │ Results are checked │───┘
        └─────────────────────┘
                   │         valid
                   ▼
   ┌──────────────────────┐        ┌──────────────┐
   │ Person in charge of  │───────►│   Results    │
   │ writing down the     │        └──────────────┘
   │ results              │               │
   └──────────────────────┘               ▼
                              ┌──────────────────────┐
                              │  Resuls are added up │◄─┐
                              └──────────────────────┘  │ If mismatch
              If match                  │               │
   ┌──────────────┐                     ▼               │
   │ Total of     │◄────────┌──────────────────────┐────┘
   │ points       │         │   Total is checked   │
   └──────────────┘         └──────────────────────┘
          │
          ▼
   ┌─────────────────┐
   │ Total of points │
   │ are announced   │
   └─────────────────┘
```

Data capture method

The data is captured using different methods.

The student names and house is taken from the school database which is filled by the secretary when a new student joins the school. The student choice of events is taken on paper sheets which are filled in by the students during their tutor time. For the track events a machine is used to record all of the times for all of the students, a teacher clocks in all of the students taking part in the event. For the field events a tape measure is used to find the length/height thrown or jumped. The sheet used by the students to choose their results as well as the sheet used to record the results are shown at the end of the interview with Mr F...

Processing

The data is recorded using some measuring equipment and is then written on a temporary result sheet where the points are assigned. These sheets are then taken to be filled in on the larger record sheets. Here the actual result isn't recorded the person filling the sheet checks that the result isn't a new record; if it is then they write it down on a separate sheet. The person then writes in the name, house, position and number of points of the student in ascending order. They then add up all of the points for each house in that age group and fill in the result into another sheet used to keep only the number of points per house and age group. This sheet is then used to calculate the final results of the day (total number of points per house). The total scores for each house as well as any new records are then outputted.

What works well what doesn't?

The data capture before the event all work very well. The sheet of paper used for the students to choose what events they take part in, during the event the collection of the results is also good, the results are timed or measured and there isn't another way that it can be done. However the last part of the system can be improved. All of the results are filled in on a large sheet of paper making it easy to make mistakes and hard to find individual results. Computerizing this part of the system would improve the efficiency of the system making the input of the results and addition of points and searching for results a lot easier.

Inputs:

- Name - Text, field size 50
- Age group - string
- Points - Numeric
- Event - string
- House - Text

Outputs:

- Total number of points for each house - numeric
- Total number of points for each house by age group • Any new records - string

Storage:

All of the documents are stored on Mr F...'s computer and in the P.E office when they have been printed. The result sheets are not kept from one year to another. For the new system the program will be stored on a computer with the files backed up on an external hard drive and also a server so that it can be shared between different computers.

Alternative approaches:

Alternative solutions to the problem were discussed with the end user.

Buying off the shelf software:

Buying off the shelf software would be a cheaper solution to the problem as well as being sure that the software will work since it has already been tested and would have the support offered with an off the shelf software.

The response to that was that sportsday is a unique event relevant only to this school so finding a software that does that will be very complicated and it might not be exactly what the user wants.

Adapting a current software:

Adapting existing software would be less costly than creating a new software but more costly than using generic software (since the software will have to be bought plus the cost of the modifications), it still has the same issues for the user. The final program will not be as fitting as creating one from scratch will be. I will also take more time since the program will have to be tested where it has been modified.

Creating custom software:

This is the chosen solution. It ensures that the software created will completely meet the demands of the user; the software can also be changed once it's been created if the user wants changes. Of course it will take longer but time isn't an issue since sportsday is a once a year event and the program can be created tested and implemented in that time.

Requirements:

These are the requirements for the new system which have been discussed and agreed with the user.

- System must be able to deal with all of the inputs (student details, results, users and events) so that it entirely replaces the old system.
- System must be able to add up the total house scores, this will be one of the main the features of the program since a large part of the problem was having to add up the total scores for each house.
- Search function to find individual results to make it easier for the users to quickly find a result in case an error has been made or simply for checking.
- User friendly interface to make the program simple and easy to use even for people who aren't familiar with computers.
- Way of writing down a new record if there is one, so that the new records can be directly entered while entering the results.
- Must be able to navigate through the results to allow to see all of the results.
- Possibility to edit result in case an error has been made.
- Must run on a windows environment since it is readily available at the school and the users are already used to it.

Examiner Comment

There was a signed agreed copy of these requirements in an appendix.

Software requirements:

Software required	Reason
Windows operating system	The program must be designed to work on a windows environment and operating system. Since all of the computers in the school run on a windows environment and the users are used to it.
Microsoft Office Access	This software is required since the program will be linked to a database created in Access because it was available.

Hardware requirements:

	Device	Function
Input device	Qwerty keyboard	To type in numerical and text data in the database such as the house and number of points.
	Laser mouse	Needed for the program's gui that will have command buttons that need to be clicked to show the information.
Output devices	17 inch flat screen monitor	Allows all of the action performed in the program to be seen in colour.
	Ink jet printer	Needed to print high quality colour documents of the sportsday result.
Storage	External hard drive	Used to make backup copies of the data and can be used to store the program if the computer doesn't have enough space.
	Usb Key	Can be used to transfer files to another computer that isn't on the network if a different computer is used during sportsday.
	Server storage 5Gb	Allows all of the information or program to be accessed by different computers on the server.
Processing	Processor (2Ghz)	Even if computers have fast enough processors, 2Ghz will make the program more effective.

Marks awarded

(ii) Investigation and analysis			[_5__/8 marks]	
		Mark	Comments	
1–2	Some elements have been discussed but little or no user involvement.		Teacher comment – good user involvement, alternative approaches mentioned, some analysis, and requirements agreed with user – see letter.	
3–4	Some evidence that an attempt has been made to interview the user and some recording of it has been made. An attempt has been made to develop a requirement specification based on the information collected.			
5–6	Good user involvement and recording of the interview(s). Most of the necessary items have been covered including a detailed discussion of alternative approaches. A requirements specification based on the information collected is present but with some omissions.	5	Examiner comment – good user involvement and recording of interviews. Alternative approaches rather superficial, diagram (labelled as dataflow but not that type of diagram) provides summary of information. The requirements specification is based on information collected but lacks detail.	
7–8	Excellent user involvement with detailed recording of the user's requirements. Alternative approaches have been discussed in depth. The report demonstrates a thorough analysis of the system to be computerised. A detailed requirements specification based on the information collected has been produced.			

(c) Design (12 marks)

(i) Nature of the solution (8 marks)

A detailed systems design (including diagrams as appropriate) should be produced and agreed with the client. Proposed record, file and data structures should be described and design limitations should be included. Design of data capture forms, input formats (with examples of screen layouts) and output formats should be included here where relevant. Process designs and a test plan for the system should also be included. The test plan should contain test data and the expected results for that data. An agreed set of objectives should also be included. These items are the design specifications, which should be agreed with the client.

Example candidate response – Flat Management

Objectives of the system

1. Use a graphical user interface to provide a user-friendly operation.

2. Provide automatic operations as adding new records, updating or changing flat records, deleting records, selling and viewing records.

3. Provide automatic storage and management of data.

4. Avoid the problem of duplication of data.

5. Provide data verification and validation to reduce the entry error as small as possible.

6. Prevent redundant process in the original system.

7. Efficient and fast operation of system.

8. Simplify the original method by connecting some operations of different tables.

9. Automatically calculate the total price of a flat when a new record is entered.

These objectives are based on the interviews and my suggestions after observing the current system. Mr W…, Ms Z… and I have agreed on these objectives. Through these objectives, I got a clear direction of developing the new system using my programming ability.

Examiner comment

These objectives were signed and agreed.

Entity relationship diagram:

According to my investigation of the current system in J… X… Real Estate, I start to design the new system from following Entity Relationship Diagram. From my observation, one supplier can supplier many flats and one buyer can buy more than one flats, so the relationship between supplier and flat is one-to-many, and the relationship between flat and buyer is many-to-one. Therefore, this ERD is already normalized.

Proposed File, Record and Data Structure:

The following three tables will be used in the new system, and the details of data information are listed as follows.

Data Dictionary

Supplier Table

Field Name	Type	Length	Validations	Description	Example
SupplierID (Primary Key)	String	10	Presence Check	This is the number to identify each supplier uniquely.	0019363422
CompanyName	String	50	Presence Check	The name of the company which supplies the flat.	J… M… Real Estate Inc.

Buyer Table

Field Name	Type	Length	Validations	Description	Example
BuyerID (Primary Key)	String	18	Presence Check	This is the number on buyer's ID Card to identify each buyer uniquely.	330283774612723423
BuyerName	String	20	Presence Check	The name of the company which supplies the flat.	J… M… Real Estate Inc.
PhoneNumber	String	15	Presence Check	The phone number is used to contact the buyer	160037523856
PreviousAddress	String	200	Presence Check	The previous address of the buyer is used for mailing or finding the buyer.	Room 1.., NO.3.. J M… Rd, P0 Box 2…, Sichuan

Flat Table

Field Name	Type	Length	Validations	Description	Example
FlatID (Primary Key)	String	10	Presence Check	This is the ID to identify a certain flat.	55670087d2
BuyerID (Foreign Key)	String	18	Presence Check (when the flat is sold)	Foreign Key. Originally occurring in Buyer Table. This field is left blank unless the flat is sold	330283774612723423
SupplierID (Foreign Key)	String	10	Presence Check (when the flat is sold)	Foreign Key. Originally occurring in Supplier Table	0019363422
RoomNo	String	10	Presence Check	The room number of the flat.	301A
BuildingNameNo	String	30	Presence Check	The name or number of the building where the flat is located.	"J… M… Building" or "F53"
StreetName	String	30	Presence Check	The name of the street where the flat is located.	Grand Garden Road
Area	Float		Format Check	The total area of the flat. Unit: Square meter.	97
UnitPrice	Float		Format Check	Price per square meter of the flat. Unit: RMB	10000
TotalPrice	Float		Presence Check	The total price of a flat. It equals unit price multiplied by area.	970000
Availability	String	10	Presence Check	This is used to show whether the flat has been sold. The system will automatically generate the status of the flat.	"Available" or "Sold"

Data input forms

All data enter the system through following input forms, so the user doesn't have to access to the database directly to save data. All the forms contain input fields and button, providing a user-

friendly interface. There are totally four input forms in the new system. Based on my observation and interviews, the following designs will meet the requirements of the system and the agreement of user.

access to the database directly to save data. All the forms contain input fields and button, providing a user-friendly interface. There are totally four input forms in the new system. Based on my observation and interviews, the following designs will meet the requirements of the system and the agreement of user.

- **New Flat**

These are two radio buttons. If the supplier is new, the user should choose the "New Supplier". Otherwise, the user should choose the first button, and select the Supplier's ID from combo box.

This is a combo box containing all the IDs of current supplier in record.

This button aims to calculate total price of a flat. It should also provide data format validations.

This text field is not editable; it is used for displaying the total price of a flat.

This button saves new suppliers to Supplier Table.

○ Supplier ID

○ New Supplier

Flat ID

Check if there is a duplication of ID

Room Number

Building Name/No

Street Name

Area (Square meter)

Price per square meter

Input fields

Total Price

Save

The button saves all records and provides presence check of all text fields.

Close

This New Flat Form is used to input new records of flats. This form contains mainly two parts. First, selecting or adding a supplier. If the supplier has been saved before in the Supplier Info Form, the user only has to choose its Supplier ID. Otherwise, the user should choose to add a new supplier. In this case, there will be two input dialogues to gather the Supplier ID and Company Name of the supplier. Another process is saving new flat records. User can input a new Flat ID and use the check button to avoid the duplication of Flat ID. Unless the new Flat ID is unique, the following text fields will not be editable. Furthermore, the user has to press a "Total Price" button which can calculate the total price of the flat and check if the "Area" and "Price per square meter" have correct data format, which is float or integer. Once the "Save" is clicked, the record is saved to Flat Info Form.

Examiner comment

There were also forms for editing records, deleting records and selling flats.

Data Output

All the data out from the system are shown in a text area. According to the structure of the original system and the ERD diagram, I designed following three output forms of data with agreements of Mr W... and Ms Z....

- **Flat Records**

The total price equals area multiplies unit price. The data type of these fields is float.

Address of Flats

Flat Records

The following are all the records of flats:

Flat ID	Buyer ID	Supplier ID	Room No.	Building Name/No.	Street name	Area	Unit price	Total Price	Availability
54300	2356	5676543	203	32a	JinDong Rd.	75	10000	750000	sold
Xxxx	xx	xxxxx	xxxx	xx	xxxxxxx	xx	xxxx	xxxx	xxx

Primary key   Foreign keys

There are only two statuses, "Sold" and "Available".

Close

The button can close the frame.

Flat Records shows all the information of flats, including sold and available ones. This frame is aim to show a history of transaction in the agency and link all flats with their certain supplier and buyers. Due to length of records, all data are represented on a text area which is not editable.

Examiner comment

There were also outputs for suppliers and buyers.

● **Data Flow Diagram**
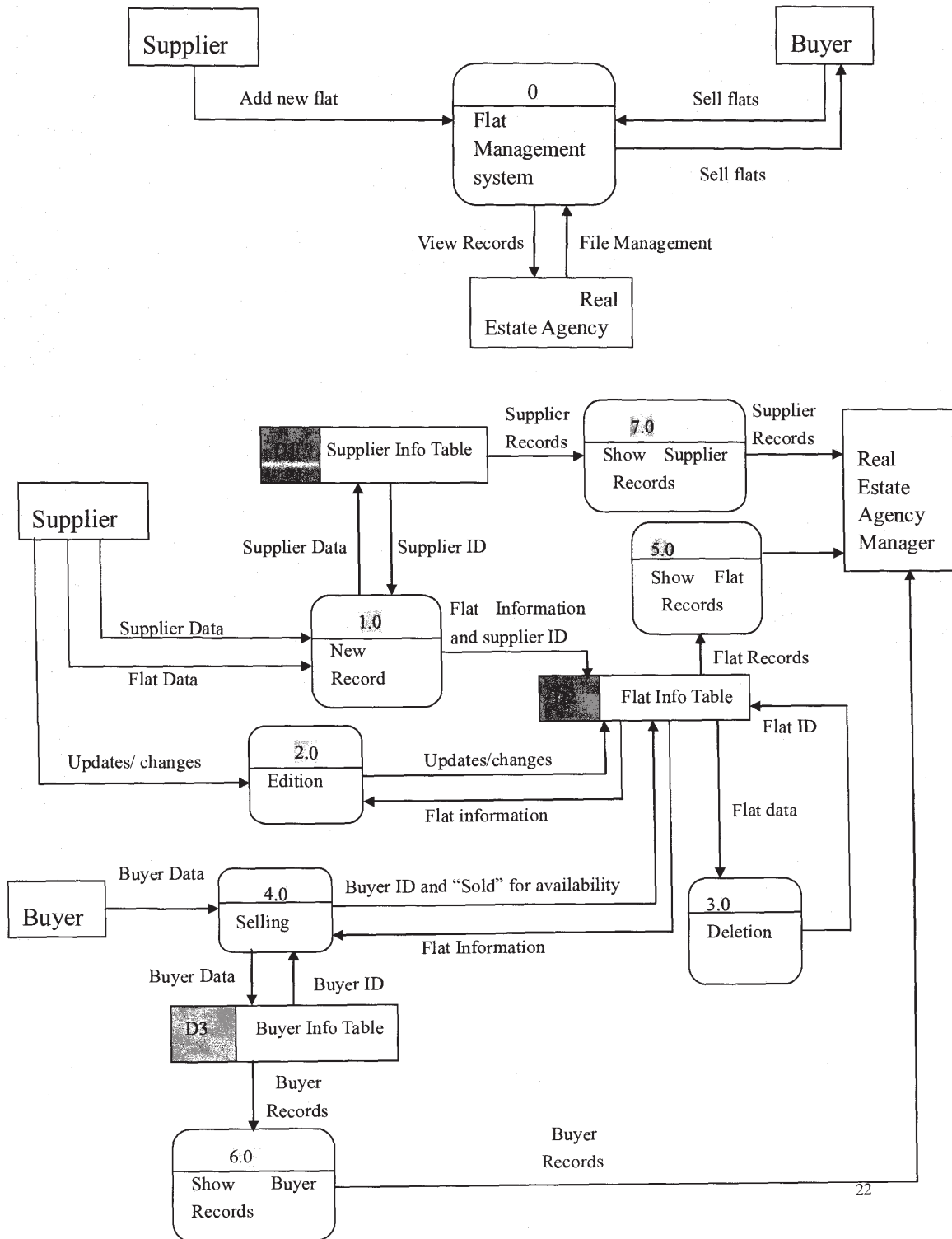
Menu and Module Design

According to the structure of the original system and the requirements of users, I proposed a new system with four main modules. Each module has its specific functions. Also, a menu design is needed to lead the user to access to different working modules. The following is my design.

Module Design
New Flat Module
Edition Module
Deletion Module
Selling Module
Viewing Records Module

Menu Design
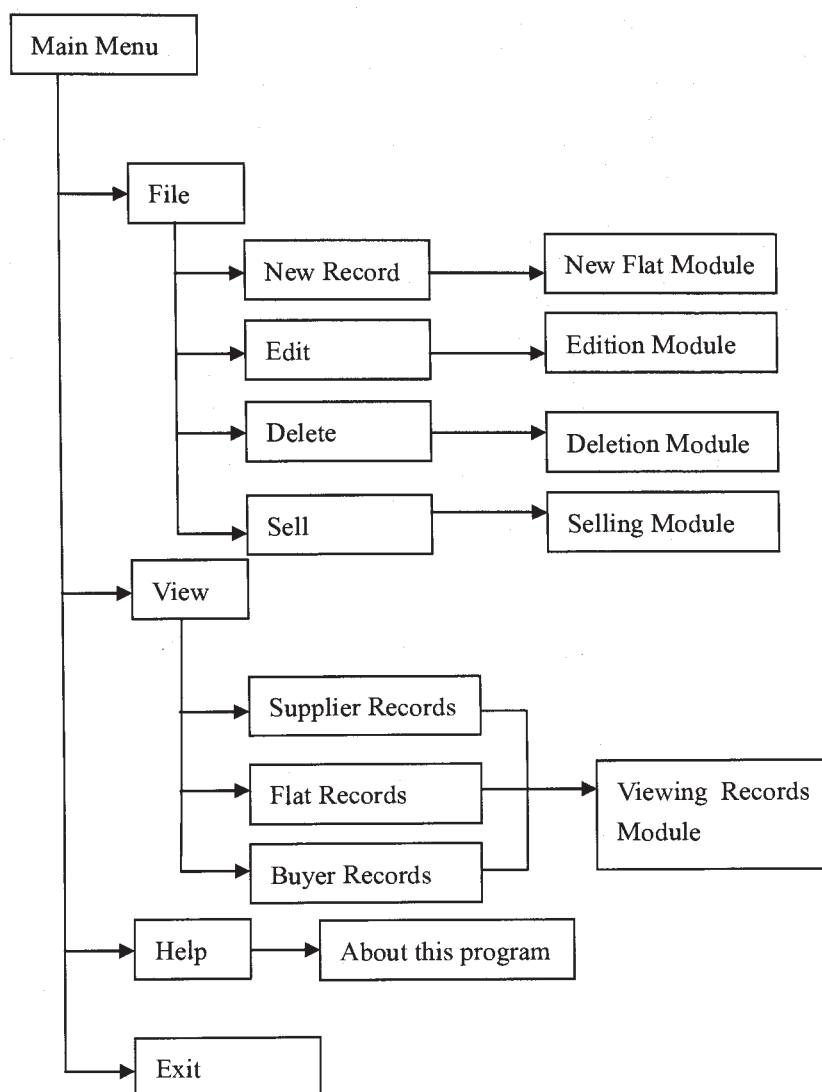
Flowcharts for different modules

Selling flats:

```
                              ┌─────────┐
                              │  Start  │
                              └─────────┘
                                   │
                                   ▼
                    ◇ Check if there are any
                      available flats. ◇
                                   │ YES
                                   ▼
                    ┌──────────────────────────┐
                    │ Read all Flat ID of      │
                    │ available flats to a     │
                    │ combo box.               │
                    └──────────────────────────┘
                                   │
                                   ▼
                    ┌──────────────────┐
                    │ Select a Flat ID │
                    └──────────────────┘
                                   │
                                   ▼
                    ╱ Show the address of the flat. ╱
                                   │
              YES                  ▼
                    ◇ Is the buyer new? ◇
                                   │ NO
                                   ▼
```

Input a new Buyer ID and other personal information.

Read all Buyer ID from Buyer Info Table to a combo box

Select a Buyer ID

Check if the Buyer ID has been saved before.

YES   NO

Insert the Buyer ID to the record of sold flat.

Save the record in Buyer Info Table

Change the availability of the flat to "Sold"

End

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Examiner comment

There were also flowcharts for new flat, editing and deleting modules.

Marks awarded

(i) Nature of the solution			[_5__/8 marks]
		Mark	Comments
1–2	Some vague discussion of what the system will do with a brief diagrammatic representation of the new system.		Teacher comment – both parties agreed on the set objectives. Examiner comment – objectives have been agreed, a design specification has been developed but the validation could be improved and there is no clear evidence that a response to the design has been obtained and acted upon.
3–4	The major objectives of the new system have been adequately summarised, but omissions have been made. There is a brief outline of a design specification, including mock ups of inputs and outputs, process model described (including a diagram: structure diagram, dataflow diagram or system flowchart). However there is a lack of completeness with omissions from the process model, inputs and outputs. Data structures have been identified but there may be inadequate detail.		
5–6	A clear set of objectives have been defined and a full design specification is included but there may be some errors or logical inconsistencies, for example validation specified may be inadequate or field lengths incorrect. There is clear evidence that a response to the design has been obtained from the end-user, and any comments have been acted upon.	5	
7–8	A clear set of agreed objectives with a detailed and complete design specification, which is logically correct. There are also detailed written descriptions of any processes/modules and a clear, complete definition of any data structures. The specification is sufficient for someone to pick up, develop and test an end result using the software and hardware specified in the requirements specification.		

(ii) Intended benefits (2 marks)

There should be some discussion of the relative merits of the intended system and of the previous mode of operation. This may include any degree of generality beyond the original scope of the system.

Example Candidate Response – Flat Management

(II) Intended Benefits

- Fast speed of operation. The new system can reduce the redundant processes in the original method and use program to increase the speed of searching, checking, entering data and many other operations. Therefore, the new system can increase the efficiency of the business.
- Reduce the amount of errors. The new system provides data validation and verification functions to reduce the input errors. Also, the system provides automatic checking of duplication of primary keys (e.g. Flat ID), so the problems of two records sharing same primary key is eliminated.
- Easy to use. Comparing to the original system, entering data, editing, deleting and all other operations can be easily done on the computerized system. The user only has to input data by typing to an input frame. The user doesn't have to access to the database directly.
- Secure keeping of records. Since the original system is based on paper, data can be damaged due to destructions of paper. In the new system, all records are kept in computer and user can also make a backup in a removable storage device, such as a flash drive.

(ii) Intended benefits			[_2__/2 marks]
		Mark	Comments
1	One valid benefit of the new system has been identified and explained.		Teacher comment – candidate has comprehensively discussed the benefits of the system.
2	The benefits of the new system have been comprehensively described.	2	Examiner comment – benefits for the flat management system have been described. But could have related better to the flat management system.

(iii) Limits of the scope of the solution (2 marks)

This may include volume (sizing limitations) and limitations of the facilities used. For full marks there must be some estimate of the size of the files required for the implemented system.

Example Candidate Response – Flat Management

(III) Limits of the scope of the solution

Although the new system might solve many problems in the original one, there are still some limits and disadvantages of using the new system. First of all, the new system has higher costs than the old one. The original method of managing records was based on papers, but the new system must run in a computer. Therefore, the agency needs to spend lots of money on creating an environment for the new system. Secondly, although the new system is user-friendly and easy to use, the user still needs some basic computer skill, for example, installing and running the new system. Also, the user may not be very used to the change of the system, and this may reduce the efficiency of the new system. Thirdly, there are some limitations of a computerized system. For example, data can be lost due to an accident power-off, and attacks of the computer system can reduce the security of the data. Therefore, the user has to make regular back-ups of data.

Table	Fields	Example	Maximum Size (in Bytes)	Size of table (in Bytes) * estimated number of records in a year
Flat Info	Flat ID	SNO2998764	10	142*20028400
	Supplier ID	13465412	10	
	Buyer ID	330302889307719364	18	
	RoomNo	A1603C	10	
	BuildingName_No	J111 Mao Building	30	
	StreetNarne	South R.. M.. Rd.	30	
	Area	80	8	
	UnitPrice	10000	8	
	TotaiPrice	80000	8	
	Availability	Available	10	
	SupplieriD	13465412	10	
Supplier Info	CompanyName	S.. M.. Real Estate Inc.	50	60*20=1200
	BuyerID	330302889307719364	18	
Buyer Info	BuyerName	P.. P…	20	253*150=37950
	PhoneNumber	13003866762	15	
	PreviousAddress	Room352, No. 425 Lai 200. M.. Rd., P..District, Shanghai, China	200	
Size of record in one year				67550
Add (+) overheads (10%)				74305
Size of Database (in KBs)				Approx. 73

Marks awarded

(iii) Limits of the scope of the solution			[_2__/2 marks]
		Mark	Comments
1	A discussion of what the system limitations are.		Teacher comment – file estimation included, limitation of the system is well discussed.
2	A detailed description of the system limitations has been given, including the estimate of the size of the files required for the implemented system.	2	Examiner comment – some limitations have been given and an attempt has been made to estimate the file size including overheads.

(d) Software development, programming, testing and installation (18 marks)

(i) Development (4 marks)

A technical description of how the solution relates to the design specification produced and agreed with the client should be included.

(ii) Programming (5 marks)

There should be clearly set out program listings that demonstrate the technical competence of the candidate. Candidates should make good use of the facilities of a procedural programming language as part of their solution.

Example candidate response – Pupil Records

Examiner comment

Samples of the type of material that the candidate included for the development and programming sub-sections are included below:

- Data structures shown by table descriptions and relationships
- Input and output shown by forms and reports
- Processing shown by queries and programming code

(d) Software development, Programming, Testing and Installation

(i) Development

System Design and Program Listing

System Design

```
                    ┌─────────────────────────┐
                    │    POC Report System    │
                    └─────────────────────────┘
            ┌───────────┬─────────┴─────────┬───────────┐
    ┌───────────┐ ┌───────────┐ ┌───────────┐ ┌───────────┐
    │   Forms   │ │  Reports  │ │  Queries  │ │  Tables   │
    └───────────┘ └───────────┘ └───────────┘ └───────────┘
```

Forms	Reports	Queries	Tables
Frmcreate	rptPOC	qryPOCreport	Tbldate
Frmlogin			Tblform
Frmmenu			Tbllogin
Frmview			TblPOC
			Tblstudent
			Tblstudentsubject
			Tblsubject
			Tblteacher
			Tblteachersubject
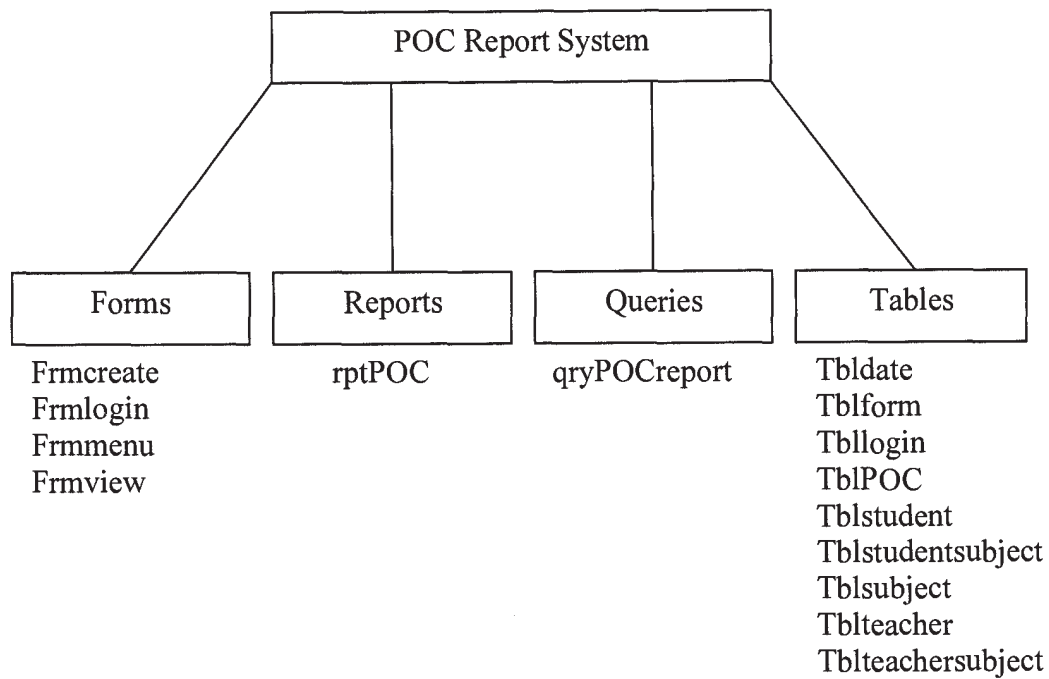
Program Listing

To prevent data duplication and maintain internal documentation order the program listings will be displayed in section (d) (ii) annotated, indented and containing clear and comprehensible variable names

tblStudent
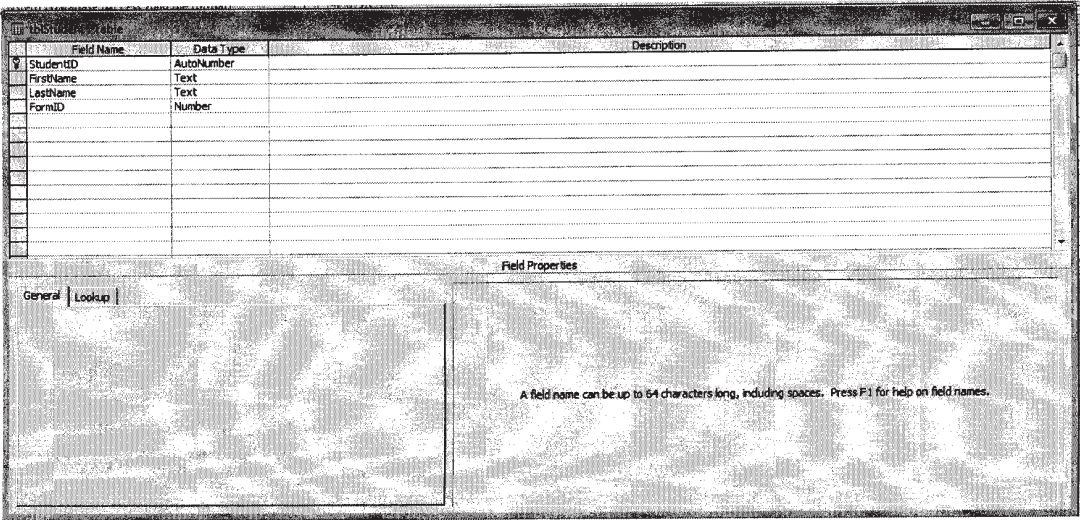
Columns

Name	Type	Size
StudentID	Long Integer	4
FirstName	Text	50
LastName	Text	50
FormID	Long Integer	4

Table Indexes

Name	Number of Fields	
PrimaryKey	1	
Fields:		
StudentID		Ascending
Student ID	1	
Fields:		
StudentID		Ascending
StudentForm Group	1	
Fields:		
FormID		Ascending
tblFormtblStudent	1	
Fields:		
FormID		Ascending

tblStudentSubject

Columns

Name	Type	Size
StudentSubjectID	Long Integer	4
StudentID	Long Integer	4
SubjectID	Long Integer	4

Table Indexes

Name	Number of Fields	
PrimaryKey	3	
Fields:		
StudentSubjectID	Ascending	
StudentID	Ascending	
SubjectID	Ascending	
StudentID	1	
Fields:		
StudentID	Ascending	
StudentSubjectID	1	
Fields:		
StudentSubjectID	Ascending	
SubjectID	1	
Fields:		
SubjectID	Ascending	
tblStudenttblStudentSubject	1	
Fields:		
StudentID	Ascending	
tblSubjecttblStudentSubject	1	
Fields:		
SubjectID	Ascending	

Table Relationships
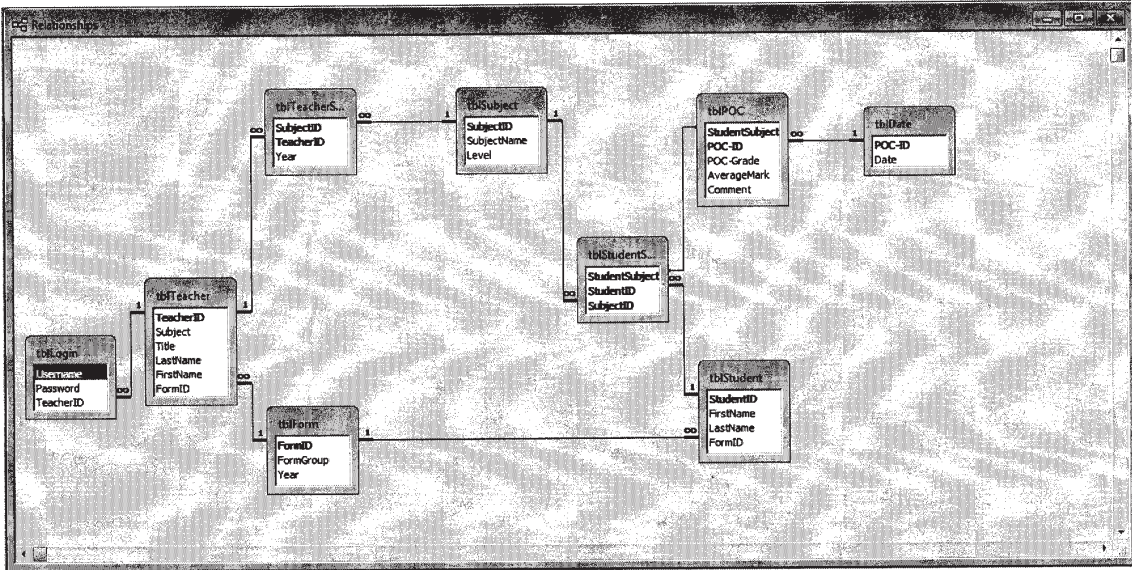
Queries

qryPOCReport
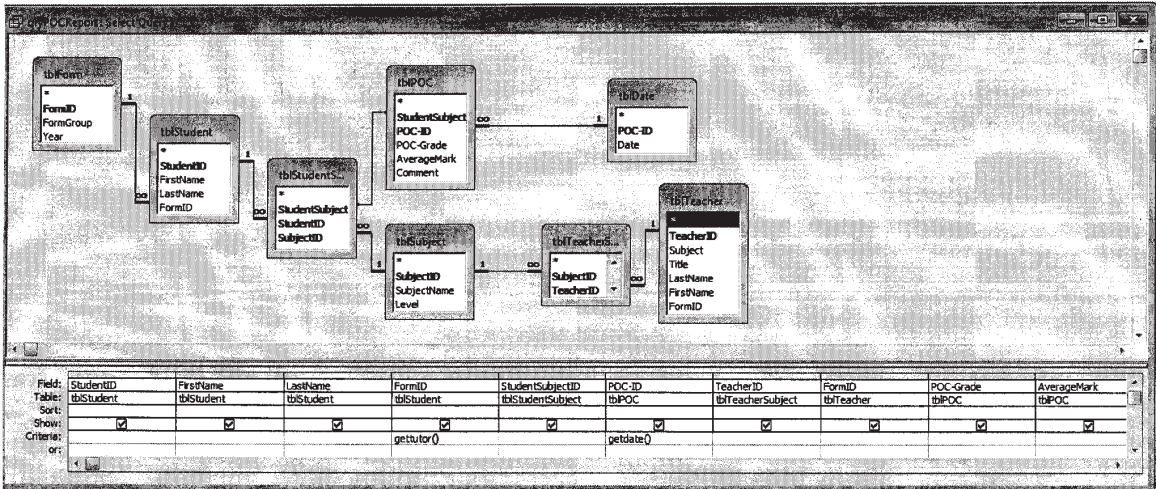
Reports

rptPOC
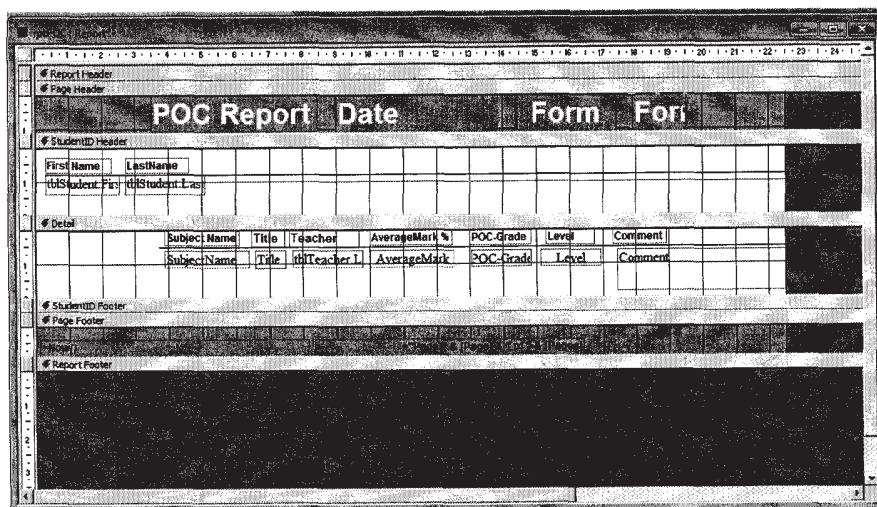
Columns

Name	Type	Size
StudentID	Long Integer	4
tblStudent.FirstName	Text	50
tblStudent.LastName	Text	50
tblStudent.FormID	Long Integer	4
StudentSubjectID	Long Integer	4
POC-ID	Long Integer	4
TeacherID	Long Integer	4
Expr1007	Long Integer	4
POC-Grade	Text	7
AverageMark	: Update Query	16
Comment	Text	50
Title	Text	5
SubjectName	Text	50
Date	Date/Time	8
FormGroup	Text	50
tblTeacher.LastName	Text	50
Level	Text	50
tblTeacher.FirstName	Text	50
tblTeacher.FormID	Long Integer	4

Data Source

QryPOCReport

(ii) Programming

Frmlogin
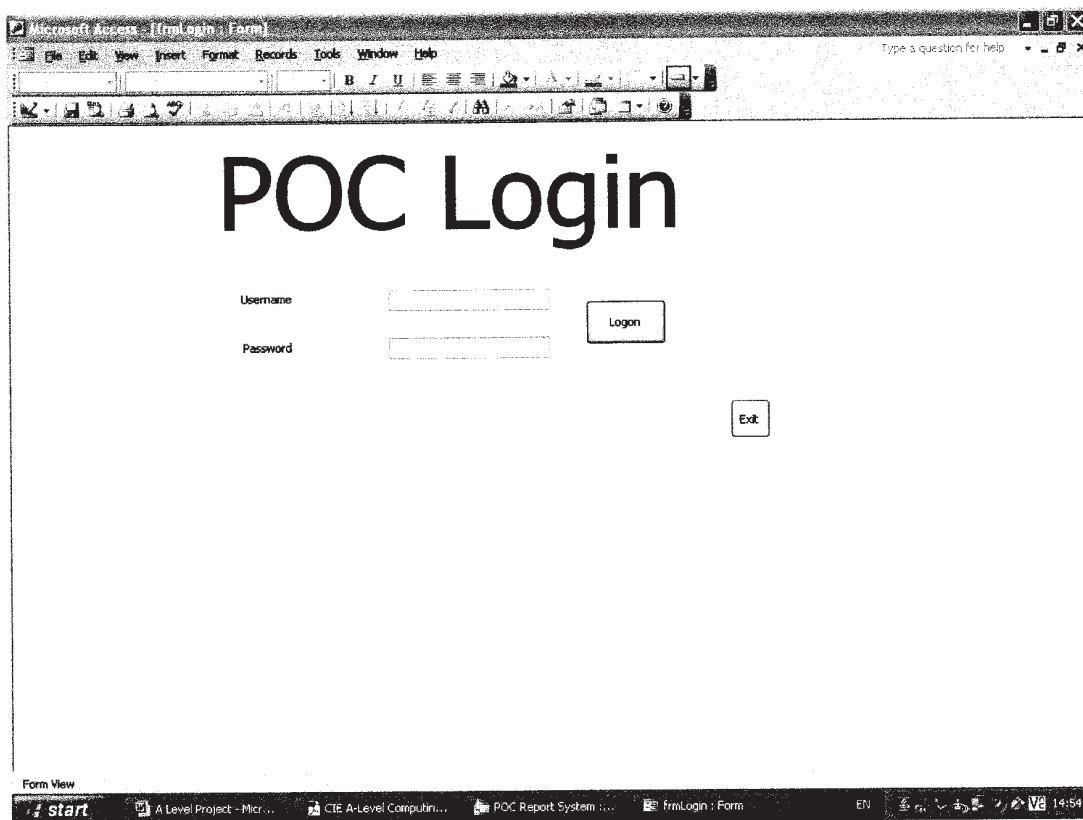
Private Sub form_load()
'Reset variables
Tutorgroup = 0
ID = 0
End Sub

Private Sub cmdlogon_Click()
'Set variables
Dim username
Dim password

'Get data from the logon form and trims it
username = Trim(Forms![frmlogin]![txtusername])
password = Trim(Forms![frmlogin].[txtpassword])

```
'Open database
Set pocsystem = CurrentDb()

'Open the table
Set poclogin = pocsystem.OpenRecordset("tblLogin", dbOpenDynaset)
Set pocteacher = pocsystem.OpenRecordset("tblteacher", dbOpenDynaset)

'Find the username and corresponding password in table if not found output correct error
message else grant access
poclogin.FindFirst "username = '" & username & "'"
If poclogin.Fields("username") = username Then
  If poclogin.Fields("password") = password Then
'Stores a teacher and tutor ID from open table as variables
    ID = poclogin.Fields("TeacherID")
    pocteacher.FindFirst "TeacherID= " & ID
    If pocteacher.Fields("TeacherID") = ID Then
    Tutorgroup = pocteacher.Fields("FormID")
'Clear username and password fields
    txtusername.SetFocus
    txtusername.Text = ""
    txtpassword.SetFocus
    txtpassword.Text = ""
    DoCmd.Close
    DoCmd.OpenForm ("frmMenu")
  End If
  Else
    MsgBox "Your Password is Incorrect"
  End If
Else
  MsgBox "Your Username is Not Valid"
End If
End Sub
```

```
Private Sub cmdexit_Click()
'Quit program
DoCmd.Quit
End Sub
```

```
'Search open table for POC entry that contains the values selected in the list boxes
pocrecord.FindFirst "StudentSubjectID =  " & Val(lstname)
If pocrecord.Fields("studentsubjectid") = Val(lstname) And pocrecord.Fields("POC-ID")
= dateid Then
'If first record exists then populate the form objects with the corresponding data in the
found record and set progress bar to green         .
    found = True
    grade = pocrecord![POC-Grade]
    setgrade
    txtavg.SetFocus
    txtavg = pocrecord![AverageMark]
    txtcomment.SetFocus
    txtcomment = pocrecord![Comment]
    lblprogress.BackColor = vbGreen
Else
'Search open table for POC entry that contains the values selected in the list boxes
    pocrecord.FindNext "studentsubjectid = " & Val(lstname)
    If pocrecord.Fields("studentsubjectid") = Val(lstname) And pocrecord.Fields("POC-
ID") = dateid Then
'If next record exists then populate the form objects with the corresponding data in the
found record and set progress bar to green
        found = True
        grade = pocrecord![POC-Grade]
        setgrade
        txtavg.SetFocus
        txtavg = pocrecord![AverageMark]
        txtcomment.SetFocus
        txtcomment = pocrecord![Comment]
        lblprogress.BackColor = vbGreen
    Else
'If no record found then set found variable to false and set the progress bar to red
        found = False
        optok.Value = -1
        lblprogress.BackColor = vbRed
    End If
End If
End Sub
```

```
Private Sub cmdsave_Click()
'Open database
Set pocsystem = CurrentDb()

'Open the table
Set pocrecord = pocsystem.OpenRecordset("tblPOC", dbOpenDynaset)

'Prompt user when similar record is found asking permission to overwrite it
If found = True Then
    response = MsgBox("Similar record already exists are you sure you would like to
overwrite it?", vbYesNo)
'Overwrite if yes is clicked else don't
    If response = vbYes Then
        txtavg.SetFocus
'Perform Null value validation – if value is null output error
        If IsNull(txtavg) or txtavg = ""  Then
            response = MsgBox("No average mark input", vbOKOnly)
        Else
        pocrecord.FindFirst "StudentSubjectID =  " & Val(lstname
'Perform grade validation – if percentage input is in possible range else output error
 If pocrecord.Fields("studentsubjectid") = Val(lstname) And pocrecord.Fields("POC-ID")
= dateid And Val(txtavg) >= 0 And Val(txtavg) <= 100 And Trim(Str(Val(txtavg))) =
txtavg Then
'If input is valid then save the data in the opened table under the correct record fields
            pocrecord.Edit
            pocrecord![StudentSubjectID] = lstname
            pocrecord![POC-ID] = dateid
            pocrecord![POC-Grade] = grade
            pocrecord![AverageMark] = txtavg
            txtcomment.SetFocus
            pocrecord![Comment] = txtcomment
            pocrecord.Update
        Else:
    response = MsgBox("Invalid value for average mark", vbOKOnly)
'Call clear procedure
    clear
    grade = pocrecord![POC-Grade]
'Call setgrade procedure
    Setgrade
'Output error and set fields back to previous values
    txtavg.SetFocus
    txtavg = pocrecord![AverageMark]
    txtcomment.SetFocus
    txtcomment = pocrecord![Comment]
    lblprogress.BackColor = vbGreen
        End If
```

Marks awarded

(i) Development			**[_4__/4 marks]**
		Mark	Comments
1	Program listings or evidence of tailoring of a software package is provided in the form of printouts. The developed solution does not fulfil the design specification. A teacher may award 1 mark if they have been shown the system working satisfactorily and there is no hard evidence in the project report.		Teacher comment – evidence of tailored software package, data structures, I/O, processing and code.
2–3	Program listings or evidence of tailored software packages are provided in the form of printouts. Data structures are illustrated as part of the listings where appropriate, detailing their purpose. There is some annotation evident to illustrate how the package was tailored for a particular purpose or to indicate the purpose of sections of code in a program listing. The developed solution has logical flaws and does not fulfil the design specification.		Examiner comment – clear development that matches the design
4	Program listings or evidence of tailored software packages are provided in the form of printouts. Data structures are illustrated as part of the listings where appropriate, detailing their purpose. There is a full set of printouts showing input and output as well as data structures. The developed solution does fulfil the design specification.	4	

(ii) Programming			**[_5__/5 marks]**
		Mark	Comments
1-2	A program listing showing code written by the candidate is included.		Teacher comment – good technical competence, formatted, meaningful variable names and annotated.
3–4	Some technical competence in programming shown by a program listing that makes use of meaningful identifier names, indentation and formatting to show the control structures used. The code should be annotated with some comments so that the logic of the solution can be followed.		Examiner comment – agreed
5	Good technical competence in programming shown by a self-documented program listing that makes good use of meaningful identifier names, indentation and formatting to show the control structures used. The code should be annotated with comments so that the logic of the solution can be easily followed.	5	

(iii) Testing (5 marks)

An attempt should be made to show that all parts of the system have been tested, including those sections dealing with unexpected or invalid data as well as extreme cases. Showing that many other cases of test data are likely to work – by including the outputs that they produce – is another important feature. Evidence of testing is essential. Comments by teachers and others are of value, but the test plan must be supported by evidence in the report of a properly designed testing process. The examiner must be left in no doubt the system actually works to the satisfaction of the client. This evidence may be in the form of hardcopy output and screen dumps.

# Example candidate response – Library System

Test Strategy:

Like most of the program in the world, my library system also suffers from errors. I have decided to test my programs before it is hand to Ms. J…. I will use many different testing strategies to ensure that very possible error is considered. I will input both normal and abnormal values to test my system. Hopefully after the testing I can reduce the number of errors to almost zero.

Test Plan

Test No	Test Objective	Test Method	Test Data Used	Expected Outcome	Actual Outcome	Evidence on page No.
1	Check the outcome if I leave the input fields empty. For example: Student ID	Left the Student ID empty and try to add a student record into database	N/A	The system will warn the user that it cannot process, and tell user to input correct data.	Successful	50
2	Check if the format check applies on the numbers	Enter a non-numeric value into a number field	asdfasdf	The system will not allow the input.	Unsuccessful But resolved	50
3	Check if the system allows 0 to be the number of a book when adding a book into the database.	Input 0 into the number field in the book section when adding a book	0	The system will not allow the input and it will warn the user.	Successful	51
4	Check if the password system functions properly(This is very import)	Enter both correct password and incorrect passwords	1234/4321/ book/ 0987/...	The system should not allow pass when wrong passwords are entered.	Successful	52
5	Check if the data can be saved after it is altered	Create a new student record	10/Tony/ 1234	The data can be directly viewed in the sql database.	Successful	53
6	Check if one student is only allow to borrow 2 books	Try to borrow three books at a time using the same student ID	N/A	The system should reject the third borrow, and warn user.	Successful	54
7	Check if the fine functions properly when student return books within 14 days	Try to generate fine when return date is not 14 days away from borrow date.	N/A	The system should display the fine to be zero.	Unsuccessful But resolved	55
8	Check if the system can process when user tries to borrow a not existing book.	Enter a Book ID which does not exist in the borrow frame	"5"	The system should warn the user and stop process. The data should not be in the database.	Unsuccessful But resolved	56
9	Check if the report functions properly	Open the reports and database to check if they matches	N/A	The report should match the database.	Successful	58
10	Check if book can still be borrowed when there is no book available	Try to borrow a book with number of 0	N/A	The system should warn user that no book is left.	Successful	59

Test# 1:
There is a presence check in most of the input forms. I test the outcome when I input Student Name and Contact but leave Student ID blank when adding a student into the database. Similarly, other input fields will produce the same warn messages when user do not enter anything into it.
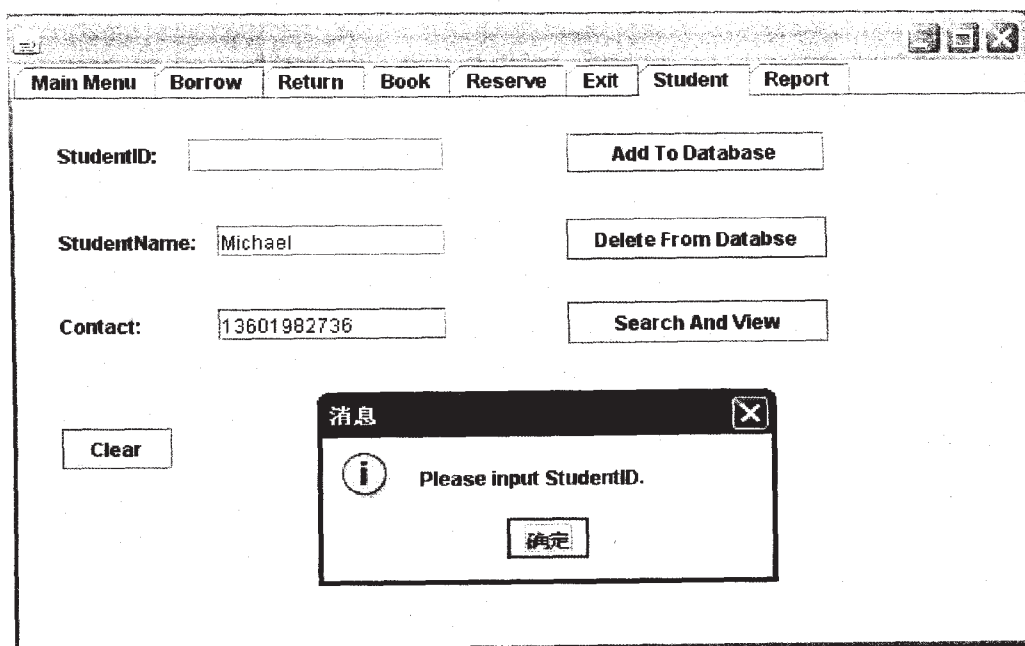
Test # 2:
There is also a format check in all fields which only allow numeric inputs. The system should not allow any non-numeric values to be entered into the fields. I tried to enter a non-numeric value into one field and the system failed to response in the proper way.
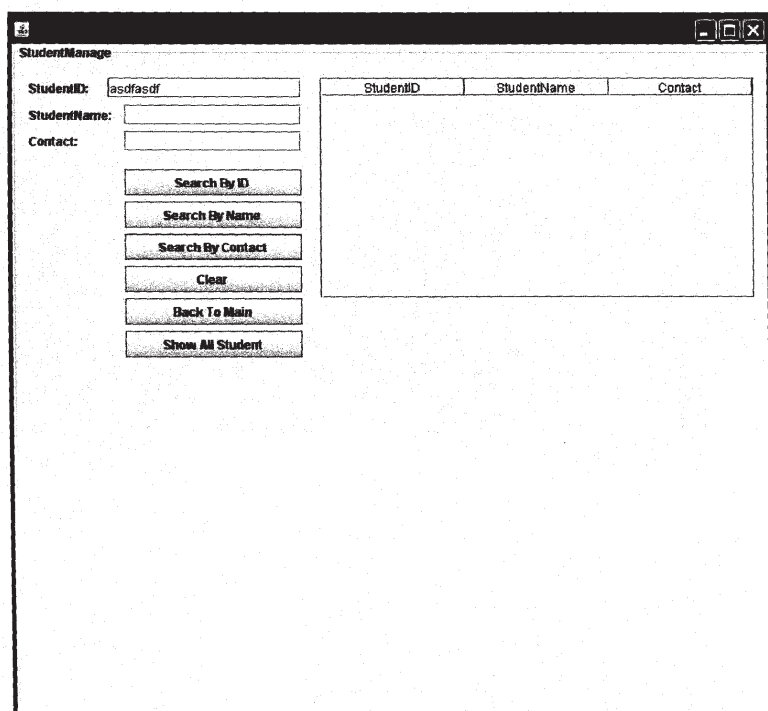
After a deep consideration of the problem, I added a code into the project and solve to problem. The code is also added into other fields which may have the same problem.

Test # 3:
The last input check is to check a particular value of input. It is the number of a book. The library rules stated that any book that is inputted into the database must have at least one copy. That means the library must buy at least one copy of the book before it is available for the reader to borrow. The system will warn the user if the user tries to do so.

Test # 4:
This test is very important for the system. It is the security check. I need to ensure that the password system functions well to avoid from safety problems. I tested a few group of wrong passwords and tried to enter the system. Only the correct password can let me in.

	UserID	UserName	Contact	UserPassword	Userlevel
☐	1	Jing Yu	123	qq	2

The correct password is 'qq'.
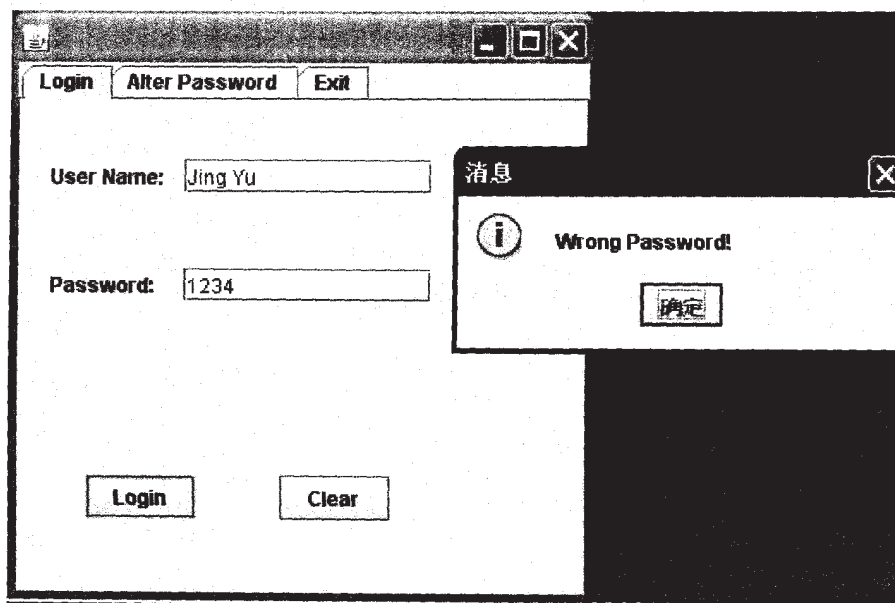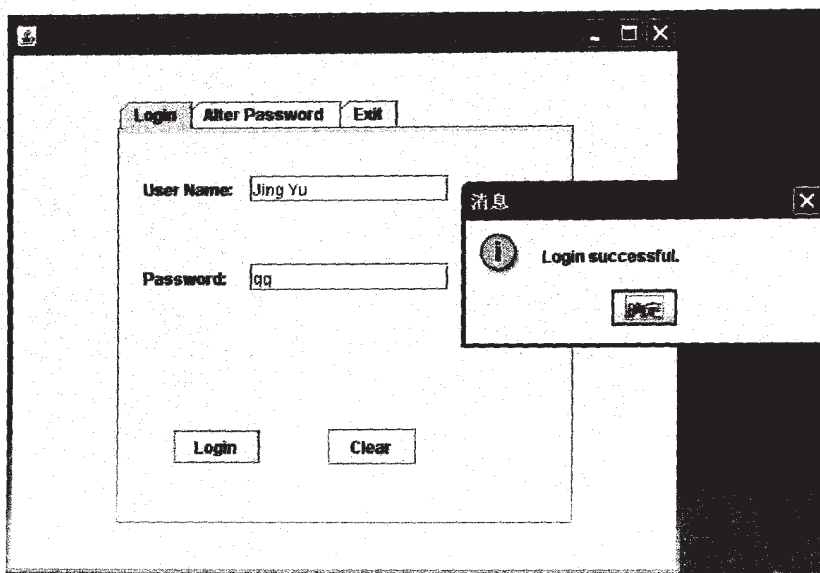
Only one set of wrong password is shown but I tested many other sets and proved that my system does not suffer from security issues.

Test# 5:
I need to test whether or not the user can save data in the database. I tried to create a new student record and tried to view it in the database after it is inputted into the system. If two set of data is exactly the same, then the system is able to save data.

	UserID	UserName	Contact	UserPassword	Userlevel
☐	1	Jing Yu	123	qq	2
☐	2	Jack	13601231122	0	1
☐	3	Tom	13601231133	0	1
☐	10	Tony	1234	0	1

Examiner comment

There were also comments and results for all the other tests in the plan, the final test 10 is shown below.

Test# 10:
There is always a chance that some books in the library have been borrowed away and there is no reserve left in the library. I need to check if my system can tell the user that no book is left during a borrow process.

My system can successfully solve this problem.

Marks awarded

(iii) Testing			**[_4__/5 marks]**
		Mark	Comments
1	A collection of hardcopy test run outputs with no test plan, or a test plan with no hardcopy evidence may also be present. A teacher may award 1 mark if they have been shown the system working satisfactorily and there is no hard evidence in the project report.		Teacher comment – evidence for every test run is provided.
2	There is little evidence of testing with a badly developed test plan with clear omissions. There is no description of the relationship between the structure of the development work and the testing in evidence.		Examiner comment – there is cross-referenced hard copy evidence for at least 8 test runs
3-4	There should be hardcopy evidence from at least eight different test runs cross-referenced to the test plan. However, not all cases have been tested.	4	
5	Evidence of each test run cross-referenced to the test plan is present in the report. Testing should include as many different paths through the system as is feasible, including valid, invalid and extreme cases. Marks may be lost for lack of evidence of a particular test.		

(iv) Installation (5 marks)

It is recognised that the client may not fully install and use the system, although this is the ultimate aim. However, to score any marks in this section, there must be some evidence that the client has seen the system in operation. This can be done in a number of ways: such as by inviting the client to see the product and allowing the candidate to demonstrate the system, or by taking the system to the client involved. There should be an installation plan written, including details of system changeover, training required and details of user testing.

Example candidate response – Pupil Record

Installation Plan

The installation plan was discussed and agreed in the meeting (mentioned below, see project diary) with the client and end user during testing.

Have the client test the system during development of the system and discuss suggested changes with the end user

1. Give the client and teacher the final project for them to test

2. Pre train staff and pilot the system for form 12 and 13 during the summer term when POCs are usually not made

3. Use feedback acquired from pilot to make any changes to the system or fix any possible bugs

4. Train staff properly depending on agreed staff training plan (see below)

5. Implement system permanently using agreed system implementation plan (see below)

6. Maintain the system temporarily before the IT understand the system completely and is self-sufficient in its maintenance

Staff Training Plan

Suggested Training Date: 25th of May - 5th of June

Reason: The dates of the closest teacher training day lie between these and are the nearest to the next term.

Suggested Training Method: Teach department coordinators at inset day, the coordinators will be able to train their department staff.

Reason: Only a handful of coordinators need to be trained so the time taken will be limited and so the changeover can be ensured.

System Implementation Plan

Method of Implementation: Direct Implementation

Reason: System is to be implemented as soon as possible and due to its simplicity and user friendliness direct implementation is the most feasible.

Suggested Implementation Date: Mid Winter Term 2011

Reason: This is next time a POC system is required.

Evidence of User Testing

A meeting was scheduled with the client and end user (see project diary). The meeting was set up so that the user and client could test the final version of the system in addition to see the written up training and implementation details that had been previously discussed. The user was then asked to fill out a questionnaire type document to provide feedback of any problems with the system and write a letter to confirm that she had seen the system and the installation plan and approved for documentation purposed. The document is included below as evidence of user testing.

M… School
6.. Avenue D.. M.. D.. F.. BP.. M.. C.. France
Téléphone 0… - Fax : 0..
e-mail : informationm-school.com
Website : http://www.m-school.com

To Whom it May Concern
I have tested the programme C.. P.. has devised for our POCs reporting system and it works.
I have also seen the implementation plan and agree with the proposals.

J.. H...

Examiner comment

This letter was on headed note paper and signed by the client, there was also a completed questionnaire, see below.

Dear Mrs H…
Below I have put a questionnaire to collect feedback about the system experience and the discussed installation procedure. Please answer all questions if possible and provide any addition notes if you feel it necessary. At the end please provide your signature to confirm that you have read and completed this questionnaire.

Question #	User Testing Related Question	Yes/No	Additional Notes
1	Did you have any outstanding problems with the Login form?	NO	╱
2	Did you have any outstanding problems with the Menu form?	No	╱
3	Did you have any outstanding problems with the View form?	No	╱
4	Did you have any outstanding problems with the Create form?	No	╱
5	Did you have any complaints about the overall design or layout of the system?	No	╱
6	Does the system provide the users will all functions necessary to POC students effectively?	YES	╱
7	Did you have any skill based problems when using the system?	NO	╱
8	Was the on screen help useful?	YES	╱
9	Do you accept the installation , staff and implementation plan?	YES	╱
10	Do you have any outstanding questions, changes and/or comments about any part of the system or installation plan?	NO	╱

End User Signature:

Jane Hart

Marks awarded

(iv) Installation				[_3__/4 marks]
			Mark	Comments
1	Details of system changeover have been documented. Some evidence of client and/or user testing is given, usually by questionnaire or written comments by fellow students or others who were not directly involved in the development of the system.			Teacher comment – implementation plan, training, user testing, changeover.
2–3	An implementation plan with details of systems changeover and training required. There is written evidence available from the client indicating that they have seen the system in operation.		3	Examiner comment – the evidence of user testing is not sufficiently detailed for 4 marks.
4	A clear and detailed implementation plan including planned systems changeover, training required and detailed stages of user testing. There is written evidence available from the client and/or user that they have tested the system and agree with the strategy for implementation.			

(e) Documentation (10 marks)

(i) Systems maintenance documentation (4 marks)

Much of the documentation will have been produced as a by-product of design and development work and also as part of writing up the report to date.

The contents of the guide should, where relevant, include the following:

- record, file and data structures used;
- data dictionary;
- data flow (or navigation paths);
- annotated program listings;
- detailed flowcharts;
- details of the algorithms used;
- adaptive maintenance to provide for some future proofing.

All parts of the guide should be fully annotated, since this is important for subsequent maintenance of the system.

The specifications of the hardware and software on which the system can be implemented should be included.

Example candidate response – Garden Centre report

E)i) Systems Maintenance Documentation

Data Dictionary

Forms

Form Name	Use
FrmMain	Displays the data in the system and allows for data manipulation
FrmInput	Can be used to input new data into the system

FrmMain Objects

Object Name	Type	Use
txtfamily	Text Box	Displays the family name of the plant in the offer currently being looked at. Source: Qryoffer
txtspecies	Text Box	Displays the species name of the plant in the offer currently being looked at. Source: Qryoffer
txtvariety	Text Box	Displays the variety of the plant in the offer currently being looked at. Source: Qryoffer
txtsupplier	Text Box	Displays the supplier name of the plant in the offer currently being looked at. Source: Qryoffer
txtprice	Text Box	Displays the price of the plant in the offer currently being looked at. Source: Qryoffer
txtdate	Text Box	Displays the date that the offer currently being looked at was given. Source: Qryoffer
Optbareroot	Option Button	Displays if the roots of the plant in the current offer will be given bare root. Source: Qryoffer
Optrootball	Option Button	Displays if the roots of the plant in the current offer will be given in a root ball. Source: Qryoffer
txtclt	Text Box	Displays if the roots of the plant in the current offer will be given in a container, and if so, the size of the container. Source: Qryoffer
txtheight	Text Box	Displays the height of the plant in the offer currently being looked at. Source: Qryoffer
txtcirc	Text Box	Displays the circumference of the stem of the plant in the offer currently being looked at. Source: Qryoffer
txtphoto	Text Box	Displays the link to the photo of the plant in the offer currently being looked at. Source: Qryoffer
txtnotes	Text Box	Displays notes about the offer currently being looked at. Source: Qryoffer
cmddelete	Command Button	Deletes the offer currently being looked at
cmdaddnew	Command Button	Opens frminput and closes frmmain
cmdreport	Command Button	Opens the report in print preview
cmdprint	Command	Prints the offer currently being looked at

	Button	
cmdphoto	Command Button	Take the photo at the location at txtphoto and displays it in imgphoto
cmdeditphoto	Command Button	Used to edit the offer. A file navigation window emerges to select the photo. The Photo's link gets input into txtphoto
cmdremovephoto	Command Button	Removes the link from txtphoto and hides the image being displayed in imgphoto
cmdsearch	Command Button	Opens access's find function window
imgphoto	Image	Displays the image of the plant from the offer being looked at

FrmInput Objects

Object Name	Type	Use
Cbofamily	Combo Box	The combo box is filled with the family_name values from Tblfamily
Cbospecies	Combo Box	The combo box is filled with the species_name values from Tblspecies
Txtvariety	Text Box	The variety name of the plant is entered here
Cbosupplier	Combo Box	The combo box is filled with the supplier_name values from Tblsupplier
Txtprice	Text Box	This is where the price of the plant is entered
Txtdate	Text Box	The date that the offer is made is entered here
Optbareroot	Option Button	If a plant is bare root, the option is selected here
Optrootball	Option Button	If a plant's roots are in a root ball, the option is selected here
Cboclt	Combo Box	The combo box is filled with the CLT values from Tblclt This combo box is only enabled if Optclt is selected
Cboheight	Combo Box	The combo box is filled with the height_range values from Tblheight
Cbocirc	Combo Box	The combo box is filled with the Circumference_Range values from Tblcirc
Txtnotes	Text Box	Any additional notes that the user wants to input can be entered here
Cmdphoto	Command Button	When this button is pressed, Cdcphoto activates and allows the user to select a photo to be input into the system. The URL of the selected photo is then saved
Txtphoto	Text Box	The address of the photo in the computer system is stored here.
Imgphoto	Image	A preview of the selected photo, after clicking Cmdphoto, is given to allow the user to see if the correct photo was selected and if the format is correct.
Cdcphoto	Common Dialog	When Cmdphoto is clicked, a window pops up that allows the user to select an (image) file which's URL is saved.

	Control (ActiveX control)	
Cmdsave	Command Button	Saves the record and clears the form for a new record to be entered
Cmdquit	Command Button	Saves the record and returns to frmmenu
Cmdcancel	Command Button	Does not save the record and returns to frmmenu

Variables

Variable	Type	Form	Use
Link	String	FrmMain	Stores the link to the photo so the LaunchCD function isn't re-launched when the link is needed again in the future
Complete	Boolean	FrmInput	Makes sure no actions are taken before the save process is complete
OfferDB	Database	FrmInput	Opens the corresponding database
OpenTable	DAO. Recordset	FrmInput	Used to open the table in which data needs to be saved
Identifier	String	FrmInput	Used to find if certain data already exists
DateIdentifier	Date	FrmInput	Used to find if data for the date already exists
Compare1	String	FrmInput	Used to compare data so no records duplicated
Compare2	String	FrmInput	Used to compare data so no records duplicated
Compare3	String	FrmInput	Used to compare data so no records duplicated
Compare4	Boolean	FrmInput	Used to compare bare root and root ball values so no records are duplicated
Compare5	Boolean	FrmInput	Used to compare bare root and root ball values so no records are duplicated
IDPlant	Integer	FrmInput	Stores the plant ID for it to be saved in tbitem at the end of the procedure
Price	Currency	FrmInput	Stores the price for it to be saved in tbitem at the end of the procedure
IDOffer	Integer	FrmInput	Stores the offer ID for it to be saved in tbitem at the end of the procedure
IDRoot	Integer	FrmInput	Stores the root ID for it to be saved in tbitem at the end of the procedure
IDHeight	Integer	FrmInput	Stores the height ID for it to be saved in tbitem at the end of the procedure
IDCirc	Integer	FrmInput	Stores the circumference ID for it to saved in tbitem at the end of the procedure
Notes	String	FrmInput	Stores the notes value for it to be saved in tbitem at the end of the procedure
Photo	String	FrmInput	Stores the photo link for it to be saved in tbitem at the end of the procedure

Tables

Table Name	Table Use
Tblitem	Acts as a central table that links all other tables together to make the database normalized
Tbloffer	Links the date ID and supplier ID to prevent data duplication
Tblsupplier	Assigns a unique ID to each supplier to prevent data duplication
Tbldate	Assigns a unique ID to each date to prevent data duplication
Tblplant	Links the family name ID, species name ID and variety to prevent data duplication
Tblfamily	Assigns a unique ID to each family name to prevent data duplication
Tblspecies	Assigns a unique ID to each species name to prevent data duplication
Tblroot	Links the CLT ID to the bare root and root ball Booleans to prevent data duplication
Tblclt	Assigns a unique ID to each CLT value to prevent data duplication
Tblheight	Assigns a unique ID to each height range value to prevent data duplication
Tblcirc	Assigns a unique ID to each circumference range value to prevent data duplication

Tblitem

Field Name	Data Type	Use
Item_ID	Autonumber	Assigns a unique ID to each record
Offer_ID	Number (Integer)	Links to tbloffer
Plant_ID	Number (Integer)	Links to tblplant
Root_ID	Number (Integer)	Links to tblroot
Height_ID	Number (Integer)	Links to tblheight
Circ_ID	Number (Integer)	Links to tblcirc
Photo	Text	Stores the photo link
Notes	Text	Stores the note(s) entered
Price_Offered	Currency	Stores the price offered

Tbloffer

Field Name	Data Type	Use
Offer_ID	Autonumber	Assigns a unique ID to each Date / Supplier combination
Date_ID	Number (Integer)	Links to tbldate
Supplier_ID	Number (Integer)	Links to tblsupplier

Tblsupplier

Field Name	Data Type	Use
Supplier_ID	Autonumber	Assigns a unique ID to each supplier
Supplier_Name	Text	Stores the supplier name

Tbldate

Field Name	Data Type	Use
Date_ID	Autonumber	Assigns a unique ID to each Date
Date	Date	Stores the date value

Tblplant

Field Name	Data Type	Use
Plant_ID	Autonumber	Assigns a unique ID to each family / species / variety combination
Family_ID	Number (Integer)	Links to tblfamily
Species_ID	Number (Integer)	Links to tblspecies
Variety	Text	Stores the variety

Tblfamily

Field Name	Data Type	Use
Family_ID	Autonumber	Assigns a unique ID to the family name
Family_Name	Text	Stores the family name

Tblspecies

Field Name	Data Type	Use
Species_ID	Autonumber	Assigns a unique ID to the species name
Species_Name	Text	Stores the species name

Tblroot

Field Name	Data Type	Use
Root_ID	Autonumber	Assigns a unique ID to each bare root / root ball / CLT combination
Bare_Root	Boolean	Stores whether the plant is bare root or not
Root_Ball	Boolean	Stores whether the plant is root ball or not
CLT_ID	Number (Integer)	Links to tblclt

Tblclt

Field Name	Data Type	Use
CLT_ID	Autonumber	Assigns a unique ID to the CLT values
CLT	Number (Integer)	Stores the CLT values

Tblheight

Field Name	Data Type	Use
Height_ID	Autonumber	Assigns a unique ID to the height range values
Height_Range	Alphanumerical	Stores the CLT values

Tblcirc

Field Name	Data Type	Use
Circ_ID	Autonumber	Assigns a unique ID to the circ. range values
Circumference_Range	Alphanumerical	Stores the CLT values

Section References

Most of the sections required for the system maintenance documentation already occur previously in this document:

Section	Page reference
Record, File and Data structures	25-29
Data Flow Diagram	24
System Component Breakdown Diagram	22
Form Navigation Diagram	33
Process Model	23
Annotated Program Listings (code)	67-87
Algorithms	34-37
Hardware and Software required	19-20

Possible Adaptive Maintenance

To further improve the system, future work and updates could include: • Connecting the database to the internet

- Connecting to the database via a smart phone
- Better sorting of data in `cboclt`, `cboheight` and `cbocirc` on `frminput`
- Use an input mask on `cboclt` and `cboheight` for added data consistency
- The ability to sort records on `frmmain` by different fields
- Have the ability to decide how to sort files on a report
- Have the ability to decide what data will be included on a report by using a search
- Be able to store more than one photo per offer
- The system could be made with larger objects and with larger windows so it doesn't appear too small/illegible on a high resolution monitor

Back-Up Procedure

Storage Media

To back-up the system, use 4 USB flash drives with a least 4 GB of free space on each.
- Two of the drives will be used to make daily back-ups
- Two of the drives will be used to make weekly back-ups

Storage Media Use

The two daily drives should be updated every other day, but separately from each other. Eg. Drive 1 should be backed-up on day 1, followed by drive 2 on day 2, then drive 1 on day 3 and drive 2 on day 4 etc.

The two weekly drive's back-up should be updated at the end of each week, working on a similar rotation pattern as the daily drives but using weeks instead of days.

Marks awarded

(i) Systems maintenance documentation			**[_4__/4 marks]**
		Mark	Comments
1–2	Some items are present with some annotation attempted.		Teacher comment – all sections present.
3–4	One or two omissions, but the rest is present and annotation is used sensibly.	4	Examiner comment – cross referencing is used sensibly so that all items can be found.

Examiner comment

Candidates do not need to duplicate evidence in their reports; this candidate's systems maintenance section makes reference to items elsewhere in the candidate's report this is acceptable or a candidate can put the required elements in the systems maintenance document and make reference into that section.

(ii) User documentation (6 marks)

Clear guidance, as friendly as possible, should be given to the user for all operations that they would be required to perform.

These would include input format with screens displays, print options, back-ups (file integrity routines), security of access to data and a guide to common errors that may occur. (Note: the candidate would **not** be required to copy out large volumes of any underlying software's user guide, but to produce a non-technical and easy to follow guide for someone with little computer knowledge.)

Some mention here of the relationship between items of software and the data they deal with may be relevant.

The user guide should be well presented with an index and, where necessary, a glossary of the terms used. Alternatively, an electronic guide could be based around hypertext links (screen dumps will be required).
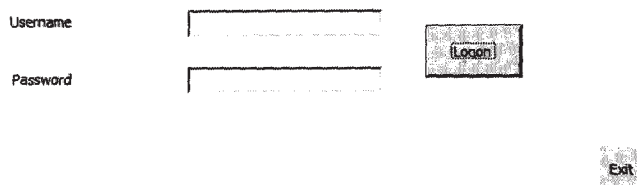
Example candidate response – Pupil Record

User Manual
(All possible errors will be displayed in the common error guide below)

Login Procedures:

POC Login
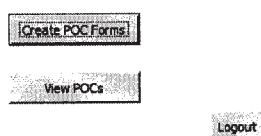
Username [_____] [Logon]

Password [_____]

[Exit]

1. Enter username and password in respective fields (see diagram above)
   - Default username will be teacher's name followed by the first letter of their last name
   - Default password will be the first word of the subject taught
   - Contact administrator for password alteration or retrieval
2. Click the Logon button when both fields have been filled in

Menu Procedures:

Menu

[Create POC Forms]

[View POCs]

[Logout]

1. Click the button labeled View or Create POCs in order to open the respective POC view or POC creation forms

POC Creation Procedures:

Create POCs

1.Editing Existing POCs
a) Select a previous POC date from the list box labeled date (see diagram above)
b) Select the academic level of the student for which the POC should be edited
c) Select the name of the student for which the editing is wanted
d) Select the grading fields in need of change and replace the desired values

2. Creating New POCs
a) Select a new POC date from the list box labeled date
b) Select the academic level of the student for which the POC should be edited from the list box labeled level
c) Select the name of the student for which the editing is wanted from the list box labeled name
d) Select the grading fields and input the desired values

POC View Procedures:

View POCs

Date	First Name	Last Name	Subject	Teacher	Form	POC Grade
01/10/2010						
01/04/2011						

View Report   Back

1. Select a POC date from the list box labeled date
2. Click the View Report button to generate reports of the existing POCs for the students in the teacher's tutor group for the selected date
   — Individual POCs can be viewed by scrolling through the list box

POC Report Procedures:

1. Click print button to open print menu allowing to print multiple or single POCs
2. Click zoom button to increase the report size on screen
3. Click cross to close the report and return to View POCs form
4. Use navigation buttons or arrow keys to navigate through form POCs

Examiner comment

Other procedures were also described in the guide.

Back, Logout and Exit Procedures:
1. Click on the labeled buttons to perform the following procedures
      - Back Button: Returns user to the previous form
      - Logout Button: Returns user to the login screen enabling other users access
      - Quit Button: Shuts down POC Lunch System

Back

Logout

Exit

On Screen Help
All objects that require input, selection, clicking or any other sort of user interaction have a
"control tip text" this will display the objects function if you place your cursor over it for 3 seconds.
Examples below list: object type (object name, form location)

Text Box (txtavg, frmcreate)   Average Mark   Enter student's average mark in % here

Command Button (cmdlogout, frmmenu)   Logout
                           Click to Logout

Date	First Name	Last Name	Subject	Teacher	Form	POC Grade
01/10/2010						
01/04/2011						

List Box (lstdate, frmview)   Select Term to view corresponding student POC results

Common Error Guide

Error	Cause	Solution
Message: "Username is incorrect"	Typo, non-existent or no username input in username textbox	Retype, contact admin or enter username
Message: "Password is incorrect"	Typo, non-existent or no password input in username textbox	Retype, contact admin or enter password
Message: "Invalid value for average mark"	Text or value outside 0-100 range input in average mark textbox	Enter numeral value between 0-100
Message: "No average mark input"	No mark input in average mark textbox	Enter value in average mark textbox between 0-100
Control tip text will not show up	Program momentarily does not recognize cursor or cursor has not being placed on the object for sufficient time	Move off the object with your cursor and back onto it again waiting 3 seconds
POCs are not being saved	Various possible causes	Contact the system administrator
Reports cannot be printed	Printer is not connected	Contact the system administrator
Program Stops Responding	Various possible causes	Press Ctrl + Alt + Delete and select task manager to end the task The system can then be restarted
Program Stops Responding	Various possible causes	Press Ctrl + Alt + Delete and select task manager to end the task The system can then be restarted

Back-up Routine

The IT department will be in charge of performing daily backups within the two week period when POCs must be filled out to ensure all data is up to date and secure. An updated copy is always held on the server which all teacher have access to.

Every term a backup is made on the school database to store all term POCs in addition to a yearly backup of the POCs finished that year on a CD that is storage in a separate location.

Two hard copies are printed for each student one to be stored in the student files and one for the tutors use during parent teacher conferences.

Finally it is recommended that teachers keep a copy of the system on a usb key or other external storage device.

Glossary

Default: Settings or values set up when a program is set up

Form: A graphical interface allowing a user to control components and make use of displayed objects

Hardware: A peripheral device that is used with a computer to enable or simplify its operation

List Box: A box used to select data from (can contain a scroll bar if it contains larger amounts of data)

POCs: Grading system used to grade students progress between terms (Praise, OK & Concern)

Query: A method of displaying specified fields in a database system using selected parameters

Record: A data structure which is used to organize data within

Report: A formatted and organized presentation of data (which can be printed) **Software:** A collection of functions and procedures required to utilize the computer

Index

Marks awarded

(i) User documentation			[_5__/6 marks]	
		Mark	Comments	
1–2	An incomplete guide, perhaps with no screen displays. Some options briefly described but difficult for the user to follow.		Teacher comment – a full user guide with all options included but descriptions could have been more detailed.	
3–4	All but one or two options fully described (for example, back-up routines not mentioned). In the main the options are easy for the user to follow with screen displays.			
5–6	A full user guide with all options described well presented (possibly as booklet) with an index and a glossary. No omission of any of the options available (including back-up routines, guide to common errors). Marks may be lost for inadequate descriptions of some options. For full marks, good on-screen help should exist, where this is a sensible option, and be present in the form of a hypertext document.	5	Examiner comment – clear user guide with all options included but description lacking in places e.g. backing up to a USB drive.	

(f) Evaluation (6 marks)

(i) Discussion of the degree of success in meeting the original objectives (3 marks)

This discussion should demonstrate the candidate's ability to evaluate the effectiveness of the completed system. The agreed set of objectives should be matched to the achievements, taking into account the limitations. Client and user evaluation is also essential, and should arise from a questionnaire or, preferably, direct evaluation. For full marks it is important that the user provides sets of data as they are likely to occur in practice, and that the results arising from such data be taken into account. This data is typical data rather than test data, and it may show up faults or problems that the candidate's own test data failed to find.

Example candidate response – Garden Centre

List of user objectives as found in section C) i)
1.   The system must be very user friendly for the Buyer
2.   The system must deal with the inputs:
   - Family Name
   - Species Name
   - Variety
   - Date Of Offer • Price Offered • Supplier Name • Bare Root
   - Root Ball
   - CLT
   - Height
   - Circumference • Photo
   - Additional Notes
3.   The system must be able to store many offers (records), keep them organized and easily accessed.
4.   There should be the ability to edit offers and delete out-dated ones.
5.   The system must save them time over the old system.
6.   Similar offers (as well as unrelated offers) must be able to be entered easily, without the need to retype a lot of data.
7.   Offers must be able to be found quickly to provide immediate feedback for customers.

Evaluation

The following table evaluates the user objectives discussed in section C)i) and gives examples of where the evidence can be founds.

	Evaluation	Evidence
1	The system has been made as easy to use as possible. Hopefully anyone can start using the system without any training, however, basic knowledge of the business is required. The input form has been separated from the main form so as not to confuse the user. Because the two forms are so similar, the photo placement and command button placements have been switched around between forms, so as to make them look less identical. On screen help has been provided to help the user further, validation rules return text boxes to point out mistakes to users etc.	Design pg 31, 33 User Documentation pg 232 - 248
2	The inputs can be entered into `tblinput` and validations are in place to ensure the data is entered in the correct format.	Input pg 142-221
3	There are several tables in a database that can deal with a lot of data. The tables are set up in such a way that the database is normalised to its 3rd form. The data is all displayed in an organized manner on the main form and can easily be navigated with the navigation buttons.	Tables pg 25 – 29 Record navigation pg 89 -98
4	Using the main form `frmmain` the user can easily edit the data being displayed, which changes it in the source tables, thus editing the original data. Using the delete command button, the user can easily delete a selected record on the main form, removing it from the source tables.	Editing pg 99-103 Deleting pg 104-106

5	The system might not initially save time over the original system, as it requires constant updating with every new offer obtained, whereas the old system required no such updating. This should cost less than a minute per offer entered. The new system should be able to save the employees time however when the offers need to be accessed. Depending on the age of the offer this could save them anywhere from a few minutes of searching the inbox to several weeks of re-negotiating.	Data access (navigation) pg 89-98 Finding Data pg 135-141 Input pg 142-214
6	Frequently used I replicated inputs have been identified for the entries that require them. These entries have been put in a combobox on the input form `frminput`. The list for each combobox is filled with the data in the table it saves to. This way any new data that is entered in the combobox is automatically added to the combobox selection list.	Input using combobox pg 142-221
7	Using the system it is very easy to quickly find data. This can be done on the main form `frmmain` either by using the navigation buttons or by using the included find function, which can be called upon using the command button.	Find pg 135 -141 Navigation pg 89-98

Degree of success

From the evaluation and evidence presented, it can be concluded that all requirements are fully met.

Marks awarded

(i) Discussion of the degree of success in meeting the original objectives		[_3__/3 marks]	
		Mark	Comments
1	Some discussion about the success, or otherwise, of the work, but with no reference to the specification set out in (c)(i).		Teacher comment – each objective discussed including where evidence can be found. Examiner comment – agreed
2	Some discussion about a number of the objectives set out in (c)(i), but some omissions or inadequate explanation of success or failure.		
3	A full discussion, taking each objective mentioned in (c)(i) and explaining the degree of success in meeting them, indicating where in the project evidence can be found to support this or giving reasons why they were not met.	3	

(ii) Evaluate the client's and user's response to the system (3 marks)

It is important that neither the client nor the user is assumed to be an expert in computer jargon, so some effort must be made to ensure that the system is user-friendly. It will be assumed that the client will have considerable knowledge of the underlying theory of the business being computerised. Clarity of menus, clear on-screen help and easy methods of inputting data are all examples of how the system can be made user-friendly. Here, marks are awarded for the degree of satisfaction that the client indicates in the acceptance procedure. Could the system or its results be used? Was the system specification achieved? Do any system faults still exist? The candidate should evaluate the client's response to the final version of the system. It is important that the client and the user become active participants in this section, and that their responses are reported and evaluated by the candidate.

Example candidate response – Garden Centre

Client's Response

<div style="border:1px solid">

E… G… G…

O…., le 23 mars 2011

Ref: Database development for stock purchase tracking

Dear Se………,

Further to our phone conversations, I am very pleased to let you know that the issues we brought up regarding the sorting and ordering in the report have been perfectly resolved thanks to your most recent changes. Having had it operational now in the company for nearly two weeks I am confident that all of the issues are now resolved.

Also, many thanks for changing the back colour to grey and changing the field layout - it's just a little more intuitive for me I find like this. The program is now very natural and instinctive to work with.

In all, a really well executed project for which we are very grateful. It has turned out to be exactly what we set out to obtain. I'm positive that this will provide us years of good use - and hopefully save us money by providing accurate and timely procurement data when it's needed.

Should you require a reference, we would be happy to provide one unreservedly.

With kind regards,

J… H…

Director, E… G… G…

</div>

Examiner comment

This letter includes specific comments about the system provided showing that the client has seen the system; it was written on headed note paper and signed by the client.

Analysis of client's response

The client had been given the software almost two weeks before asking for a response as part of a beta test, so the system could be fully tested in use, the user could get used to the system and formulate an opinion on its functionality and suitability. After the client had used the program for a few days, he was asked for an initial impression and ways of possibly changing the system to better suit their use of it.

The client had a few minor issues regarding the layout of the main form, however the functionality of the system was fully approved with as of yet no faults being detected. The layout designs were promptly changed to the manner the client had requested.

The client was given several more days to use the system as a test. The client was then asked for a final opinion on the system over the phone. What followed was a discussion with the client asking specifically how he felt about the final system, considering user-friendliness, functionality and the future use of the program. The client had indicated to be fully satisfied.

As can be seen in the e-mail sent by the client on the 23rd of March, 2011:

- The client indicates the current, final system is very user friendly: "The program is now very natural and instinctive to work with."

- The client indicates the current system is of great use to them and will most likely be used by them in the future: "I'm positive that this will provide us years of good use"

- The client indicates the current, final system lives up to the requirements identified at the start of this project, and that the system performs the task it was planned to do correctly: "It has turned out to be exactly what we set out to obtain"

- The client indicates that after an extended test period, there are no known faults with the system: "Having had it operational now in the company for nearly two weeks I am confident that all of the issues are now resolved."

Marks awarded

(ii) Evaluate the client's and user's reponse to the system			[_3__/3 marks]
		Mark	Comments
1	Some effort has been made to make the system user-friendly, but the user still has difficulty using the system.		Teacher comment – see scanned letter.
2	The system is, in the main, user-friendly, but there is room for improvement (e.g., no on-screen help has been provided). The user indicates that the system could be used but there are some faults, which need to be rectified.		Examiner comment – client indicates the system is user friendly and the candidate has evaluated their response.
3	A fully user-friendly system has been produced. The user indicates that the system fully meets the specification given in section (b), and there are no known faults in the system.	3	

Example candidate response – Bridal Shop

Examiner comment

The response below is minimal, the candidate hasn't drawn on the evidence provided in their project report to support the evaluation; the client's response appears to be contrived and hasn't been evaluated by the candidate.

Evaluation

Evaluation letter
Next page

Achievements

The new system is able to do the following functions:

- It should be able to calculate the total price for the cashier instead of her doing it manually.
- It should store records of all he transactions made in the bridal shop e.g. number of items bought a day or at the end of each week.
- It should allow the staff member to the following tasks after they have successfully logged into their accounts;
      i. Record down all services rendered to customers
      ii. Automatically calculate cost of the services the customers received.
      iii. Issue a receipt to a customer.
- It should allow the manager to do the following tasks after he is logged in;
      i. Add new employees
      ii. Edit employee details
      ill. Delete employee details

Recommendation

The new system was not able to perform the following tasks;
- It should not allow non members to login into the system
- It should not allow members of staff apart from the manager to order for new items.

Desirable extension

If a new system is to be created then it should be able to automatically order for new items instead of sending a message to the manager alerting him that the stock level of a certain item is low. Sometimes the manager has a lot of work to do so he might forget to order for new stock which leads to a very big loss for the bridal shop when customers come to buy the items and they find out that the item is not in stock.

Examiner Comment

Desirable extensions are not required.

> C…. BRIDAL SHOP
> P.O Box xxxx,
> J…, South Africa

Dear Madam,

RE: Evaluation Letter

I am writing this letter on behalf of C… bridal shop to congratulate you on a job well done. The computerized system met all the required objectives. It has improved the working time in the bridal shop and I am very grateful.

> Thank you
> Yours truly,
> MR. Smith
> Manager

Examiner Comment

This letter added little, there are no comments about the actual system; it appeared to have been word-processed by the candidate.

Marks awarded

(i) Discussion of the degree of success in meeting the original objectives			[_1__/3 marks]
		Mark	Comments
1	Some discussion about the success, or otherwise, of the work, but with no reference to the specification set out in (c)(i).	1	Teacher comment – none Examiner comment – very brief, provides little evidence just repeats requirements.
2	Some discussion about a number of the objectives set out in (c)(i), but some omissions or inadequate explanation of success or failure.		
3	A full discussion, taking each objective mentioned in (c)(i) and explaining the degree of success in meeting them, indicating where in the project evidence can be found to support this or giving reasons why they were not met.		

(ii) Evaluate the client's and user's response to the system			[_1__/3 marks]
		Mark	Comments
1	Some effort has been made to make the system user-friendly, but the user still has difficulty using the system.	1	Teacher comment – none Examiner comment – letter not authenticated, desirable extensions not required.
2	The system is, in the main, user-friendly, but there is room for improvement (e.g., no on-screen help has been provided). The user indicates that the system could be used but there are some faults, which need to be rectified.		
3	A fully user-friendly system has been produced. The user indicates that the system fully meets the specification given in section (b), and there are no known faults in the system.		

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