**Victorian Certificate of Education
2009**

STUDENT NUMBER

Letter

Figures

Words

INFORMATION TECHNOLOGY: SOFTWARE DEVELOPMENT

Written examination

Thursday 12 November 2009

Reading time: 3.00 pm to 3.15 pm (15 minutes)
Writing time: 3.15 pm to 5.15 pm (2 hours)

QUESTION AND ANSWER BOOK

Structure of book

Section	Number of questions	Number of questions to be answered	Number of marks
A	20	20	20
B	5	5	21
C	12	12	49
			Total 90

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

Materials supplied
- Question and answer book of 20 pages with a detachable insert containing a case study for Section C in the centrefold.
- Answer sheet for multiple-choice questions.

Instructions
- Remove the insert containing the case study during reading time.
- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.

- All written responses must be in English.

At the end of the examination
- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple-choice questions

Instructions for Section A

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

A major weakness of a bus topology is

A. if there is a cable break the whole network is likely to fail.

B. if a computer fails the whole network is likely to fail.

C. it is more expensive to install than other topologies.

D. it is more difficult to install than other topologies.

Question 2

When writing an algorithm, logic errors can occur.

The best way to discover if an algorithm contains logic errors is to

A. check the variable names.

B. read the internal documentation.

C. design and use test data to test the algorithm.

D. convert the algorithm into a program and run it.

Question 3

The writing of a computer program's code for a new system occurs in which phase of the Systems Development Life Cycle?

A. development phase

B. analysis phase

C. design phase

D. testing phase

Question 4

A random access file is best described as a file where records

A. have no fixed length.

B. must always be read in order.

C. are kept sorted by a key field.

D. can be accessed by using their record number.

Question 5

The best reason for using a naming convention for program elements is that

A. it makes the program run faster.

B. it makes the program look more professional.

C. it makes it easier for a user to use the program.

D. it makes the program code easier to read and understand.

Question 6

A disaster recovery plan documentation would be prepared in which phase of the Systems Development Life Cycle?

A.   design phase

B.   analysis phase

C.   evaluation phase

D.   implementation phase

Question 7

Project management requires precise scheduling of time throughout the duration of a project. Within this schedule there will be a set of tasks that must be completed on time if the project is to finish on time.

The term a project manager would use for this set of tasks is

A.   goal.

B.   target.

C.   milestone.

D.   critical path.

Question 8

A company has decided to introduce a new system into three stores initially, and then three additional stores each fortnight until all stores are online.

This implementation method is called

A.   parallel.

B.   phased.

C.   direct.

D.   pilot.

Question 9

User documentation that details the steps to take in order to operate software is called

A.   a Quick Start Guide.

B.   an Installation Guide.

C.   a Procedures Manual.

D.   a Technical Reference Manual.

Question 10

Using encryption software when transmitting data means

A.   data intercepted on route is unreadable.

B.   data cannot be intercepted on route.

C.   data arrives at its destination faster.

D.   data is sent in smaller packets.

Question 11

Mary works at a digital photo processing shop. The staff save the files brought in by customers onto the hard disk of a desktop computer before processing them. At the end of each day Mary copies all the photo files that have been processed onto DVDs. She places the DVDs into a fireproof cabinet and deletes all the copied files from the desktop computer's hard disk.

The procedure Mary follows is best described as

A. backing up of files.

B. archiving of files.

C. disposal of files.

D. encryption of files.

The following information relates to Questions 12–16.

A program is being purpose-designed for the Australian Underwater Surf Association. It will be used to manage a very large amount of data about the association's members.
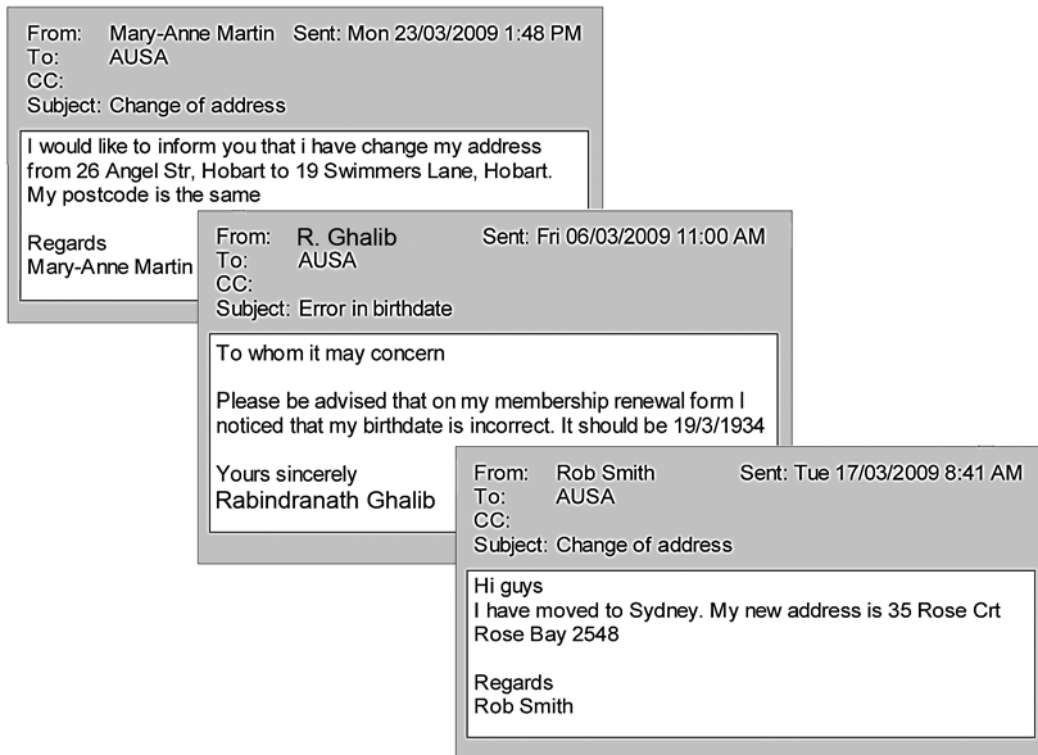
So that information about members can be added, deleted and edited, a user interface has been created. The following image is a screen shot of the user interface.
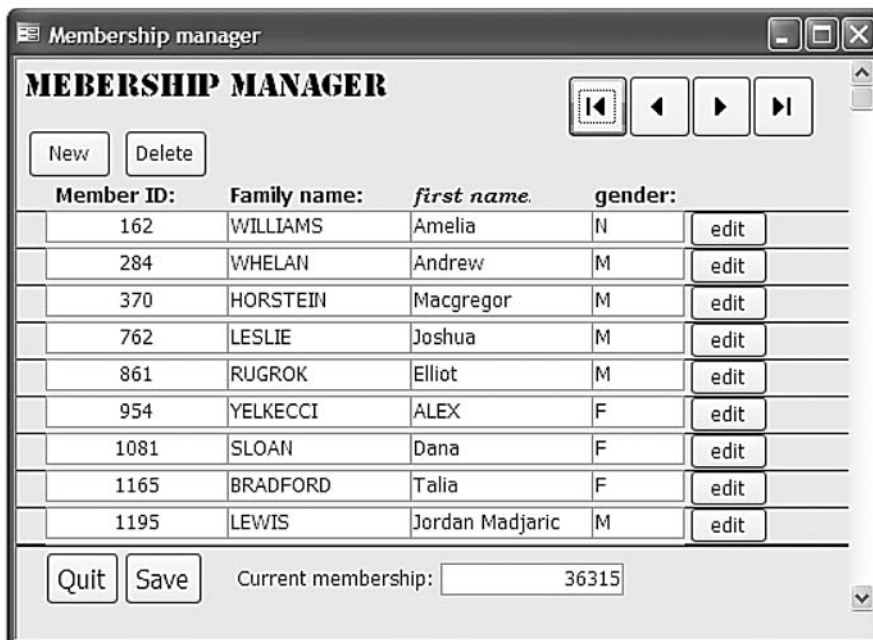
The software developer trialled the user interface with users for two weeks. At the end of the two weeks, users reported their experience to the developer.

Question 12

During the trial period users had to edit the details of several hundred members. The information about changes to member details came mostly by email, some examples of which are shown.

```
From:   Mary-Anne Martin   Sent: Mon 23/03/2009 1:48 PM
To:     AUSA
CC:
Subject: Change of address

I would like to inform you that i have change my address
from 26 Angel Str, Hobart to 19 Swimmers Lane, Hobart.
My postcode is the same

Regards
Mary-Anne Martin
```

```
From:   R. Ghalib          Sent: Fri 06/03/2009 11:00 AM
To:     AUSA
CC:
Subject: Error in birthdate

To whom it may concern

Please be advised that on my membership renewal form I
noticed that my birthdate is incorrect. It should be 19/3/1934

Yours sincerely
Rabindranath Ghalib
```

```
From:   Rob Smith          Sent: Tue 17/03/2009 8:41 AM
To:     AUSA
CC:
Subject: Change of address

Hi guys
I have moved to Sydney. My new address is 35 Rose Crt
Rose Bay 2548

Regards
Rob Smith
```

Which single feature of the user interface would cause the most annoyance to users?

A.   the placement of the buttons

B.   the black and white colour scheme

C.   the display of records in member ID order

D.   the different fonts used in the field headings

Question 13

When the 'save' button is clicked the program can take up to one minute to save all the data. The trial users reported that they did not know how long they might have to wait or when they could start editing again.

The best way for the developer to deal with this is to

A.   program in a 'meter' which displays how much is left to save and disappears when the save is complete.

B.   program a message to be displayed which says 'please wait'.

C.   program a message to be displayed after the save is complete which says 'records saved'.

D.   do nothing because a minute is not such a long time.

Question 14

From the screen shot of the user interface, what evidence is there of a serious error in the data validation process?

A.   A help button is missing.

B.   The title has been misspelt.

C.   A gender has been entered as 'N'.

D.   A first name has been entered all in capitals.

Question 15

When the program is running it stores the data shown in the screen shot in an array of records called NAMES. Another array of records called CONTACTS is used to store contact details for each member. When the program's user clicks 'edit' that member's contact details are displayed on the screen.

The field most likely used by the program to link the two arrays is

A. Member ID.

B. Family name.

C. First name.

D. Gender.

Question 16

Member ID numbers must be between 1 and fifty thousand (50 000). When a new member is added, the program uses the following code to generate a new member ID number.

$$Member\ ID = 1 + int(rand(\ )*100000/2)$$

where   rand( ) returns a six-digit random number between zero and one, and

int( ) returns the integer part of whatever number is in the brackets.

If a new member is being added and rand( ) returns 0.002222, then Member ID will be set to

A.   2

B.   12

C.   112

D. 1112

The following information relates to Questions 17 and 18.

ASM is a small business that has a suite of offices on the first floor of a building. It uses an old local area network (LAN) for its business operations. A floor plan of two offices and part of the LAN are shown in the following diagram.
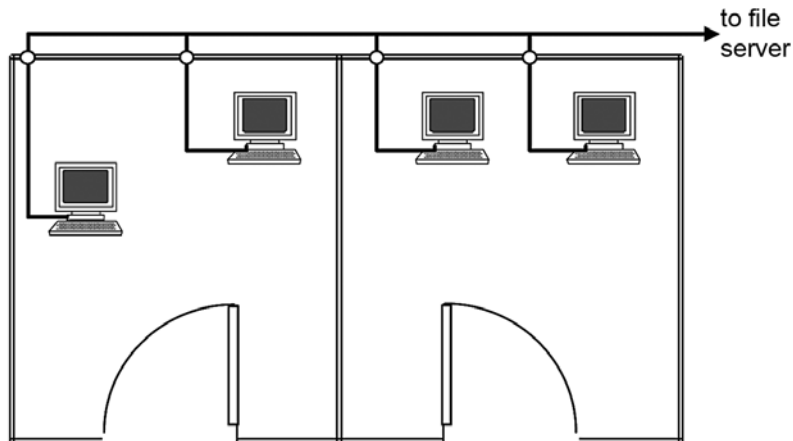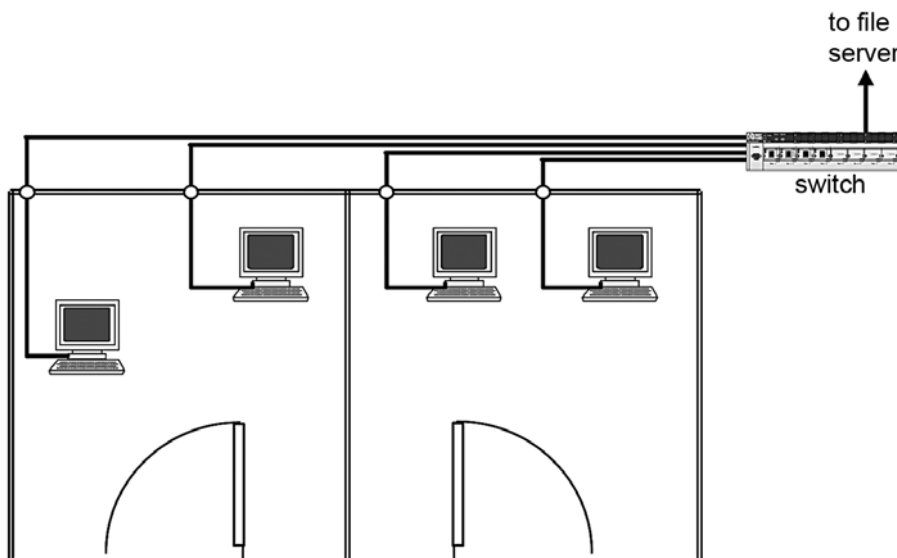

Question 17

When the LAN was first installed its goal was to improve the overall **efficiency** of the transfer of information within the business.

To achieve this goal there were a number of system objectives, one of which could have been

A.   to eliminate the need to copy data to and from CD.

B.   to improve the clarity of information presented on screen and paper.

C.   to minimise errors in data when it was transferred from one computer to another.

D.   to maximise the amount of time workers could spend speaking to one another about work issues.
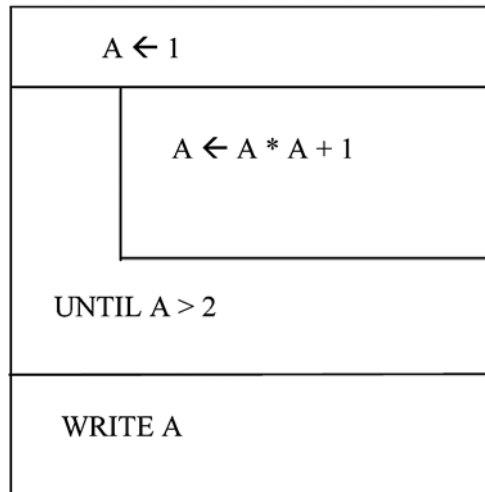
Question 18

ASM's local area network is now outdated and it no longer meets its system goal. It has been suggested that a new network be installed as shown in the following diagram.

Based on the two network diagrams, the topology of the network is most likely being changed from

A.   a star network to a bus network.

B.   a star network to a hybrid network.

C.   a bus network to a hybrid network.

D.   a bus network to a star network.

Question 19

```
┌──────────────────────────────────────┐
│  A ← 1                                 │
├────┬─────────────────────────────────┤
│    │                                  │
│    │     A ← A * A + 1                 │
│    │                                  │
│    │                                  │
├────┴─────────────────────────────────┤
│  UNTIL A > 2                           │
├──────────────────────────────────────┤
│  WRITE A                               │
└──────────────────────────────────────┘
```

The output for the Nassi-Shneiderman diagram above would be

A. 2

B. 3

C. 5

D. 6

Question 20

A software company has a policy that 50% of all lines in a program must be internal documentation lines.
The reason for this is

A. it makes the program easier to use.

B. it makes the program code more efficient.

C. it makes the program output easier to read.

D. it makes the program easier to alter by another programmer.

END OF SECTION A

SECTION B – Short answer questions

Instructions for Section B
Answer **all** questions in the spaces provided.

Question 1

A clothing store Data Base Management System (DBMS) is being updated to include more fields about items on sale. The following field types are available.

Numeric Integer, Numeric Floating Point, String/Text, Boolean, Time/Date

Select the **most** appropriate field type for the fields below.

Field	Field type
Colour	
Date purchased	
Supplier phone no. e.g. (03) 9987 2121	
Still available?	

4 marks

Question 2

Robert owns a small business selling handmade model cars. Recently there has been more interest from overseas customers. He has decided to launch a website to take orders for the sale of his model cars online.

List **three** potential advantages for his business.

Advantage 1 _____

_____

_____

Advantage 2 _____

_____

_____

Advantage 3 _____

_____

_____

3 marks

Question 3

A school has decided to purchase a new electronic roll-marking software package. The software allows teachers to mark a student absent by scanning a barcode printed next to the absent student's name in the rollbook. This is done by using either a portable computing device that has a built-in barcode reader or by using a barcode reader that can be attached to an existing portable device. The information is then transmitted wirelessly to a central computer which alerts the coordinators of students absent from class. As the school supplied its staff with portable computing devices just last year, the principal wants to purchase only barcode readers which staff can use on their existing devices. Before purchasing the new system the school needs to check the specifications of the existing devices.

From the list below select the **three** features that the existing portable computing devices **must have** for the roll-marking system to work and justify your selection.

A large 8.2" screen
B ability to store and run additional software
C full keyboard
D stylus
E ability to connect to wireless LAN
F ability to connect to Ethernet cable
G ability to connect to external devices (such as GPS sensor and barcode reader)

Feature	Justification

$2 + 2 + 2 = 6$ marks

SECTION B – continued

Question 4

A program is needed to process data for stock items. The data is stored in a file on disk. The file could contain up to 500 records. Three typical records are shown in the following table.

Item ID	Item name	Number in stock	Cost ($)
1	CD RW drive	2	23.50
2	4 Gb RAM	6	54.00
3	17" monitor	2	223.00

Juan, a novice programmer, is writing the program. He has chosen a programming language that recognises the following data types: integer, floating-point decimal, text and Boolean. It will also allow the creation of data structures such as arrays and records.

Juan will use a variable named ItemCost to hold the cost of an item. He has decided to make ItemCost an integer.

a. Explain why this is not the most appropriate choice of data type.

_____

_____

2 marks

b. State the data type he should have chosen.

_____

1 mark

c. Juan knows that for the program to run most efficiently it should read all the relevant data into memory first. He starts by making a large number of variables: ItemCost1, ItemCost2, ItemCost3, and so on.

A colleague sees this and tells Juan that an array will be much more efficient.

Explain why.

_____

_____

_____

_____

_____

_____

2 marks

Question 5

A programmer wishes to check that when a new product number is entered, it is valid and within the prescribed limits. If it is invalid then the user needs to know why. The programmer has chosen to validate the data in the following order: Existence test, Numeric test, Range test.

Explain **why** this **order** is necessary.

_____

_____

_____

_____

_____

_____

3 marks

Total 21 marks

END OF SECTION B

SECTION C – Case study

Instructions for Section C

Answer **all** questions in the spaces provided. Remove the case study insert and read **all** the information provided before you answer these questions. Answers must apply to the case study.

Shaun hires Rose Wood, a systems analyst, to look into how Truss-Tee can change its system to enable the designers to share jobs across Australia.

Question 1

To help understand the existing system, Rose first tries to identify the main reason for Truss-Tee wanting to change its system.

a.   State the main reason for Truss-Tee changing its system.

_____

_____

                                                                                          1 mark

b.   Is this a technical, economic or social factor?

_____

                                                                                          1 mark

Question 2

After interviewing the people in the Melbourne factory, Rose has produced a data flow diagram (DFD) of the factory's current computer-assisted manufacturing system (see Figure 3 in the insert).

a.   State the names of the processes that are performed by the program **MyCut DESIGNER**.

_____

                                                                                          1 mark

b.   State which of the PCs are used to perform the 'Validate client data' and 'Create new job' processes.

_____

                                                                                          1 mark

c.   Explain the purpose of the 'Validate client data' process.

_____

_____

                                                                                          1 mark

Proposed system

Rose has found that the MyCut software is designed only to work on local area networks. To allow work to be shared between factories she proposes that a large format scanner be placed in each factory. The purpose of the scanner will be to scan house plans. Rose also proposes the following procedure, using the Melbourne factory as an example.

Step 1: When the Melbourne factory receives a set of plans for a house it will scan them and save each sheet as a separate Graphic Interchange Format (GIF) file. On average each set of plans has four separate sheets.

Step 2: If the factory in Melbourne cannot do the design work, but the factory in Perth can, then the Melbourne factory will send the GIF files to Perth via the Internet.

Step 3: When the Perth factory has entered the plans into its MyCut DESIGNER, it will export the engineering data and cost data to a text file. The text file will be sent to the Melbourne factory.

Step 4: The Melbourne factory will import the text file into its MyCut DATABASE. It will then produce the cutting data and proceed as usual.

Rose wants the scanner connected to PC1. She expects each GIF file to be at least 40 Mb in size. She also expects that each factory will scan about 250 sets of plans in a year. Adding the scanner will mean that other changes will have to be made to the system.

Question 3

Apart from speaking to people or contacting MyCut, suggest how Rose might have found out that the software can only operate on a local area network.

_____

_____

_____

2 marks

Question 4

Perform a suitable calculation and use your result to explain why the existing Internet connection in each factory will no longer be appropriate.

Calculation

Explanation _____

_____

_____

_____

_____

3 marks

Question 5

The system software, office software and MyCut DATABASE on PC1 currently take up about 16 gigabytes (Gb) of disk space.

a.　What is the minimum storage capacity (in gigabytes) that PC1 will need if it also has to store one year of GIF files?

_____

_____

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　1 mark

b.　In each factory many flammable materials are stored to keep the machinery working. Rose proposes that in the new system a full backup of PC1's files is made at the end of every day.

Suggest a suitable backup medium. Justify your answer.

_____

_____

_____

_____

_____

_____

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　2 marks

Question 6

PC1 will need to be upgraded in the new system. Rose has short-listed three computers whose specifications are shown in the table below. Taking into account Rose's plans for PC1, as stated in the proposed system, list the **three** most important specifications she needs to consider in order to choose the most appropriate computer. Explain why each of these **specifications is important for the new PC1**.

Specification	ABC	GP	Bell
Storage	120 Gb Hard Drive	250 Gb Hard Drive	160 Gb Hard Drive
RAM	4 Gb	3 Gb	2 Gb
CPU	4 GHz	3 GHz	4 GHz
DVD/CD drive	DVD +/– RW	DVD +/– RW	DVD +/– RW
Ports	3 USB 2.0	3 USB 2.0	6 USB 2.0
Input	Wireless keyboard/mouse	USB keyboard/mouse	USB keyboard/mouse
Connectivity	Gigabit Ethernet	Gigabit Ethernet	Gigabit Ethernet
Screen	24" LCD 2560 × 1600	27" LCD 1920 × 1200	24" LCD 1920 × 1200

Specification 1 _____

Explanation _____

_____

_____

Specification 2 _____

Explanation _____

_____

_____

Specification 3 _____

Explanation _____

_____

_____

2 + 2 + 2 = 6 marks

Question 7

During her analysis of the system, Rose interviewed all the assemblers in the Melbourne factory. One assembler mentioned that sometimes RoboCut would reject a good piece of timber.

Rose investigates this and finds that the problem started after the last software upgrade six months ago. She contacts MyCut and it claims that none of its other users have reported this problem. After some argument MyCut agrees to send Rose the algorithms related to the software changes. She finds one algorithm that has to do with the cutting process. RoboCut uses this algorithm to check whether or not a piece of timber is long enough to use.

      Function Check_Length(Timber_Length, Length_Required)
      Begin
          If Timber_Length>Length_Required **Then**
              Return **true**
          Else
              Return **false**
          End if
      End

Rose decides to test this algorithm by choosing a length of timber (Timber_Length) of 2.4 metres. For the other variable (Length_Required) she chooses the values 2.3, 2.4 and 2.5.

a.   Explain why Rose selected these values.

_____

_____

_____

_____

_____

_____

3 marks

b.   Complete the following table showing what the algorithm should return and what it actually returns.

Length_Required	What should be returned	What is actually returned
2.3 metres		
2.4 metres		
2.5 metres		

2 marks

c.   Explain why RoboCut only sometimes rejects a good piece of timber.

_____

_____

_____

1 mark

d.   State one alteration to the algorithm that would correct this error.

_____

1 mark

Question 8

Rose recommended changes to the system's hardware and hoped to keep the software unchanged. However she now realises that there is a software fault that must also be corrected. MyCut is reluctant to believe that its software has a fault. Rose contacts some of her friends in the software industry and finds one who says he can provide her with the source code for the MyCut software. This will allow her to make her own changes to the program and correct the fault herself.

Discuss the ethical and/or legal issues faced by Rose in this situation.

_____

_____

_____

_____

_____

_____

_____

_____

4 marks

Question 9

The new system requires a significant hardware purchase by Truss-Tee of a large format scanner for each of its factories. Two suppliers have been identified that can provide scanners with the right technical specifications for Truss-Tee at a comparable price of about $13 000 each. To help Truss-Tee choose between the two suppliers, **identify** two other factors that are important for Truss-Tee to consider and **explain** why these factors are important for Truss-Tee.

Factor 1 _____

_____

_____

_____

Factor 2 _____

_____

_____

_____

4 marks

Question 10

Rose believes that Truss-Tee should use a pilot changeover method to the new system. She suggests to Shaun that the Melbourne factory should be the first to change. Shaun realises that for the new system that Rose has proposed, a pilot changeover will not work.

a. Identify the feature of the new system that makes a pilot changeover inappropriate.

_____

1 mark

b. Explain why this feature makes a pilot changeover inappropriate.

_____

_____

_____

1 mark

c. Recommend and justify a changeover method that Truss-Tee could use.

_____

_____

_____

_____

2 marks

Question 11

Now that Truss-Tee has upgraded its computer network it needs to improve its network security to ensure the protection of its information. For each type of protection solution listed below, provide an **example** and **explain** how it provides protection for Truss-Tee's information.

Software solution _____

_____

_____

_____

Physical solution _____

_____

_____

_____

$(1 + 2) + (1 + 2) = 6$ marks

Question 12

Truss-Tee is establishing the evaluation criteria for the new system. The main system goal is to efficiently and effectively share the design workload between all the sites. In order to measure the success of this it has determined a number of criteria that must be met.

Criterion 1

To ensure that the processing of plans takes no longer than it used to whether the work is done on-site or interstate.

Criterion 2

To ensure the reliability of the system is maintained now that fewer staff will be handling the design process.

The table below outlines the evaluation strategy Truss-Tee has put in place to measure one of these criteria.

Complete the table to outline a strategy they could use to evaluate the **second criterion**.

Evaluation strategy	Criterion 1: Processing of plans takes no longer than it used to	Criterion 2: Reliability of the system is maintained
Time frame	3–6 months after implementation	
Data to be collected and from where	Quote dates from PC1 Job logs from designers Cutting start dates from assemblers Historical data from previous system	
How the data will be used to evaluate the criteria and the overall goal	Data about when quotes are generated will give a start date for the process. The job logs will determine when the designers process the plans and the cutting start dates will determine when the job was finalised. This data can be compared against historical data related to job times to ensure that the new system meets this criterion. This assists in demonstrating that the goal of efficiently sharing the design workload is achieved.	

5 marks

Total 49 marks

END OF QUESTION AND ANSWER BOOK

CASE STUDY INSERT FOR SECTION C

Please remove from the centre of this book during reading time.

Truss-Tee organisation

Truss-Tee manufactures timber roof trusses and wall frames for housing construction projects (see Figure 1).
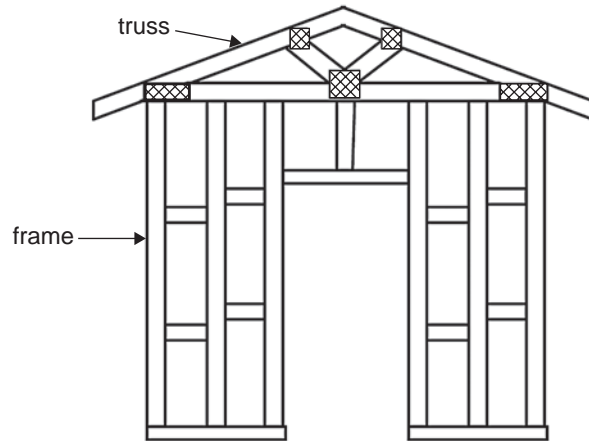

Figure 1

The business is almost 30 years old and has factories in Melbourne, Sydney, Brisbane and Perth.

In 2001 Truss-Tee converted all four factories from manual manufacture to computer-assisted manufacture of trusses and frames. In each factory identical systems were set up and these are still in operation today.

Current system – hardware and software

The hardware specifications for one factory are shown in the network diagram (see Figure 2).

Network diagram for one factory
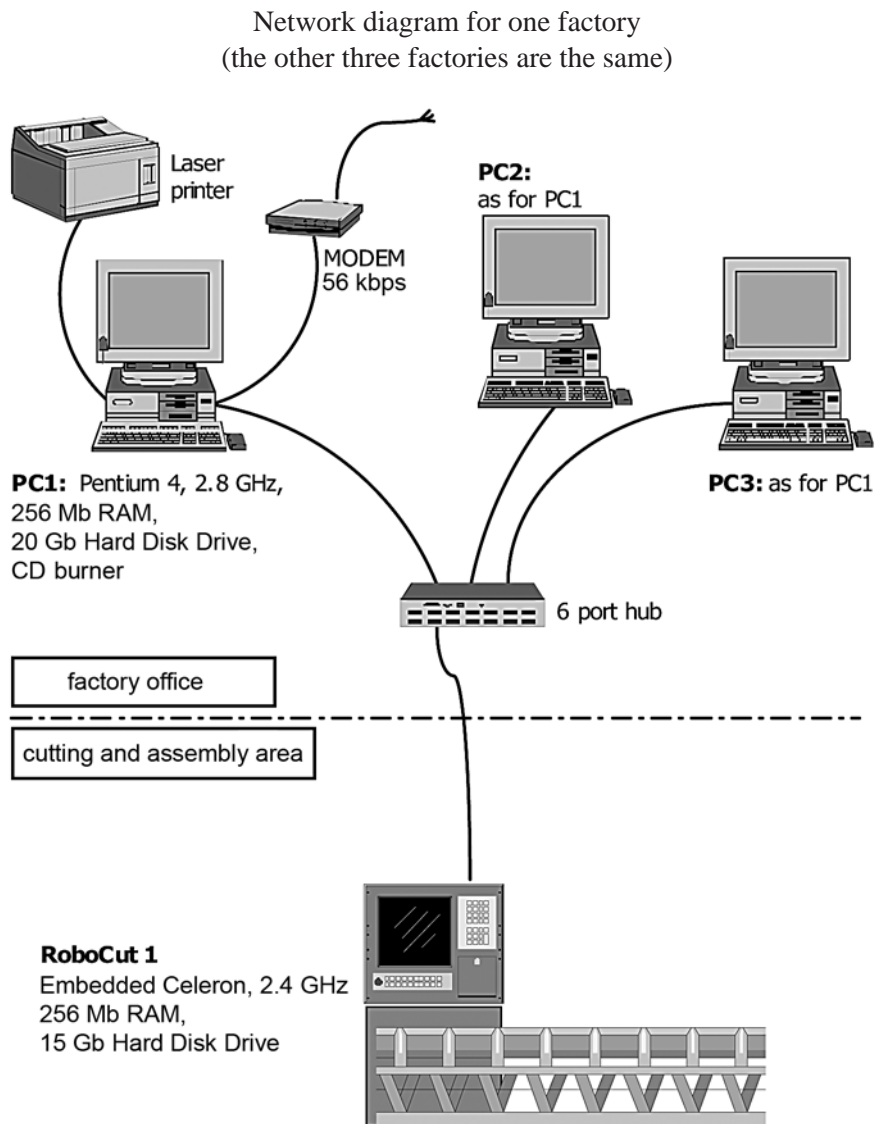(the other three factories are the same)

Figure 2

RoboCut is a computer-controlled timber cutting system.

The main software component in each factory system is a package called 'MyCut 2020'. Truss-Tee pays an annual licence fee of $8800 to MyCut and this entitles it to receive all package upgrades. The package has two parts.

• MyCut DESIGNER – installed on PC2 and PC3

• MyCut DATABASE – only installed on PC1

PC1 also has office-style software installed.

Current system – people and their roles

Each factory has a manager, two designers and eight assemblers.

- **The manager** uses PC1 to carry out management tasks, including answering letters and emails, and dealing with the factory's financial matters. The manager also works with clients. This includes starting a new job by entering the client's details into the MyCut DATABASE and later preparing a quote. The quote cannot be prepared until the designers have created the cost data. When they have, the manager obtains the transport cost from Move It, a trucking company, and combines it with the cost data stored in MyCut DATABASE to produce the quote.

- **The designers** use PC2 and PC3. They enter detailed house plans for each job using MyCut DESIGNER. This is done by drawing the plans on the screen and typing in the dimensions. It is an exacting task requiring a sound knowledge of building practice, so the designers must be qualified carpenters. Depending on the size of the plans it can take three to eight hours to properly enter plans for one house.

  Once the house plans are entered MyCut DESIGNER works out the best design of the trusses and frames and creates the engineering data and cost data needed for the job.

  When a job is ready for the manufacturing stage, one of the designers uses MyCut DESIGNER to produce cutting data and sends this to the RoboCut machine. This takes about five minutes.

- **The assemblers** put the trusses and frames together after RoboCut has cut all the timber required for a job. Once assembly is complete the trusses and frames are transported to the building site.

The data flow and processing described above is shown in the data flow diagram (DFD) below.

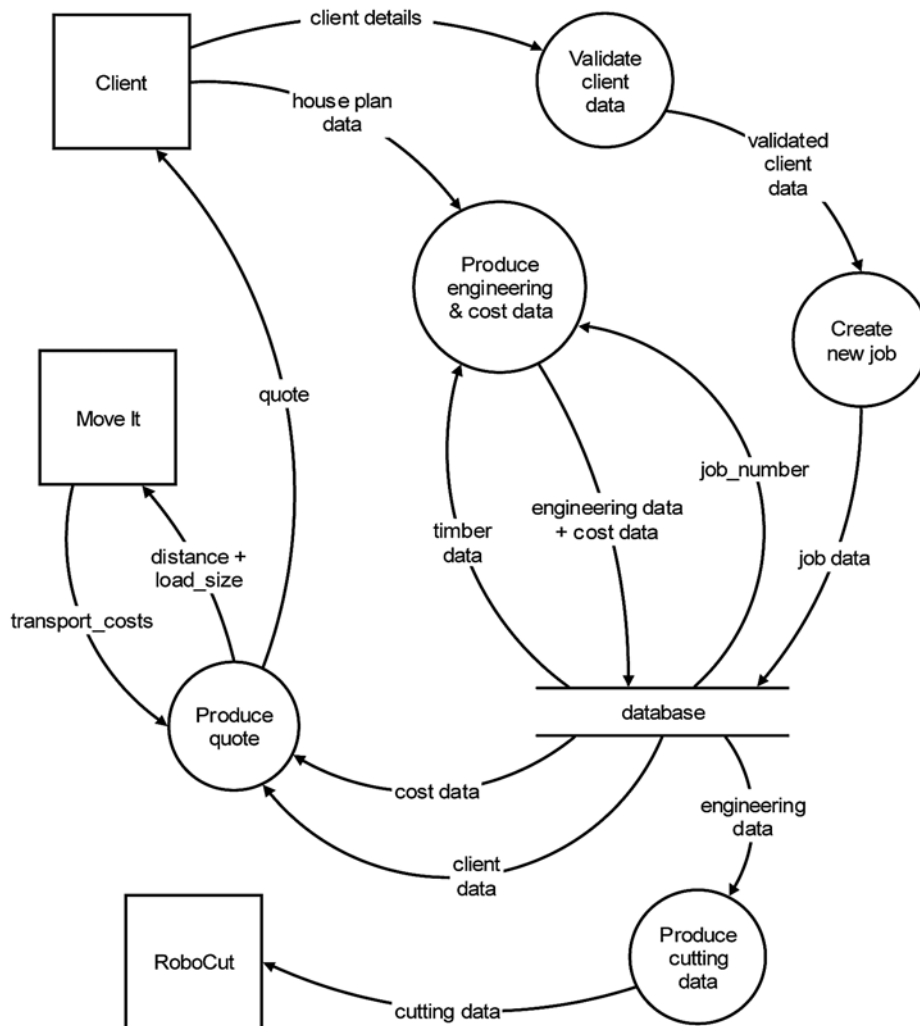## The logical DFD for one Truss-Tee factory system

Figure 3

The problem

Last year two designers resigned from Truss-Tee, one from the Sydney factory and one from Melbourne. With an Australia-wide skill shortage, Truss-Tee has not been able to find two qualified carpenters who can do the designer jobs. It has tried to retrain some of the assemblers, but this has not proved successful.

Later this year the other designer in Melbourne is due to retire. Truss-Tee is very concerned about how it can continue to provide high quality service if it cannot obtain skilled carpenters.

Shaun Truscott is the managing director of Truss-Tee. He is aware that each factory has times when its designers have little to do. If their workload could be shared across the four factories, Truss-Tee would not need so many designers.

END OF CASE STUDY INSERT FOR SECTION C