**Western Australian Certificate of Education
Examination, 2011**

Question/Answer Booklet

COMPUTER SCIENCE

Stage 3

Please place your student identification label in this box

Student Number: In figures

In words   _____

_____

Time allowed for this paper
Reading time before commencing work: ten minutes
Working time for paper: three hours

Materials required/recommended for this paper
To be provided by the supervisor
This Question/Answer Booklet
Source Booklet

To be provided by the candidate

Standard items: pens, pencils, eraser, correction fluid/tape, ruler, highlighters

Special items: non-programmable calculators, MATHOMAT and/or Mathaid and/or any
system flowchart template

Important note to candidates
No other items may be taken into the examination room. It is **your** responsibility to ensure that
you do not have any unauthorised notes or other items of a non-personal nature in the
examination room. If you have any unauthorised material with you, hand it to the supervisor
before reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of exam
Section One: Short answer	25	25	70	70	40
Section Two: Extended answer	4	4	110	110	60
				Total	100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2011*. Sitting this examination implies that you agree to abide by these rules.

2. Write your answers in the spaces provided in this Question/Answer Booklet. A blue or black ballpoint or ink pen should be used. Wherever appropriate, fully labelled diagrams, tables and examples should be used to illustrate and support your answers.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question. Where no specific instructions are given, you should feel free to use a range of formats to express your knowledge and understandings.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
   • Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
   • Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Section One: Short answer **40% (70 Marks)**

This section contains **25** questions. You must answer **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Suggested working time: 70 minutes.

Question 1 (4 marks)

The Central Processing Unit (CPU) is made up of three main components. Name **two** of these components and describe what they do.

Question 2 (2 marks)

You work on the help desk for a real estate agent and have received a call regarding a printer that is not working. Explain **two** troubleshooting procedures you would suggest to the user.

See next page

Question 3   **(4 marks)**

Consider the following database table.

Customer (CustID, Firstname, Lastname, Address, Suburb, Phone)

CustID	Firstname	Lastname	Address	Suburb	Phone
2020	Annette	Hill	9 Ashburner St	Guildford	(08) 9977 4893
2028	Bob	Underwood	80 Raglan St	Manly	(02) 9976 3227
2019	David	Watts	77 Whistler St	Midland	(08) 9976 5100
2025	Denise	Quigley	2 Cove Ave	Midland	(08) 9976 6965
2011	Derek	Hamilton	120 Addison Rd	Manly	(02) 9977 1183
2017	Elizabeth	Florence	58 West Esplanade	Guildford	(08) 9949 6220
2029	Fred	Marsh	44 Kenneth Rd	Manly Vale	(02) 9949 3115
2016	Gary	Tester	209 Pittwater Road	Manly	(02) 9977 7570
2015	Georgia	Queen	89 Pittwater Rd	Midland	(08) 9977 0811

Write a query that would search the customer table for the names of all people who live in Midland.

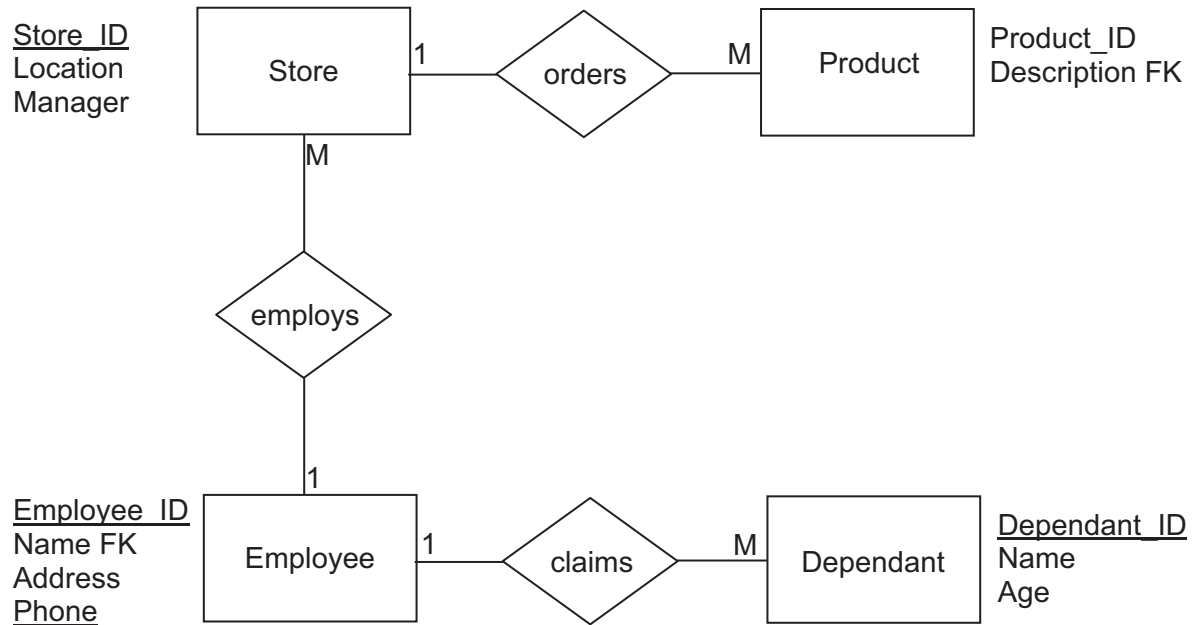**Question 4**   **(2 marks)**

Field/Element Name is a data definition in a data dictionary. Name **two** other definitions.

Question 5   **(4 marks)**

The following Entity Relationship Diagram (ERD) was created to show that one store can order many products, that one store employs many employees and that one employee claims for many dependants.

(a)   There are a number of errors in this diagram. Describe **two** of the errors.   (2 marks)

_____

_____

_____

_____

(b)   Identify a primary key as labelled in the diagram above.   (1 mark)

_____

(c)   Identify a relationship in the diagram.   (1 mark)

_____

Question 6 **(2 marks)**

Describe what is required to access and save data on this web form.

_____

_____

_____

_____

Question 7 **(4 marks)**

Define the following **four** terms in a relational database.

Record: _____

_____

Attribute: _____

_____

Foreign key: _____

_____

Form: _____

_____

See next page

Question 8 **(1 mark)**

What is the purpose of the ARTISTS/SONGS entity?

_____

_____

_____
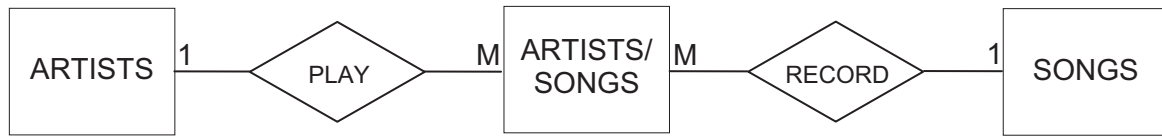
Question 9 **(2 marks)**

Modem is short for modulator demodulator, which describes the way a modem operates.
Explain what happens during these **two** steps.

Modulator: _____

_____

_____

Demodulator: _____

_____

_____

Question 10 **(2 marks)**

Explain how cache works in the context of the Central Processing Unit (CPU).

_____

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_____

See next page

Question 11 **(2 marks)**

The image below shows a graphical representation of a fragmented disk.
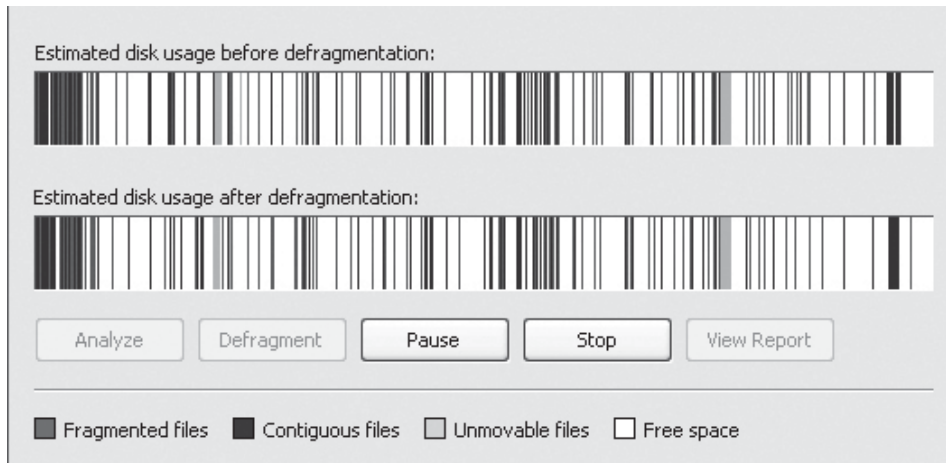
(a) What is a fragmented disk? (1 mark)

_____

_____

(b) Why is it important to defragment this disk? (1 mark)

_____

_____

Question 12 **(2 marks)**

The image below illustrates the difference between a virtual machine (Diagram B) and a non-virtual machine (Diagram A).
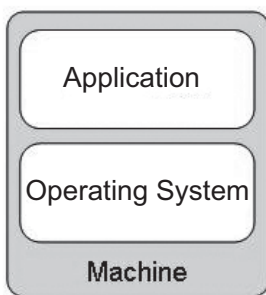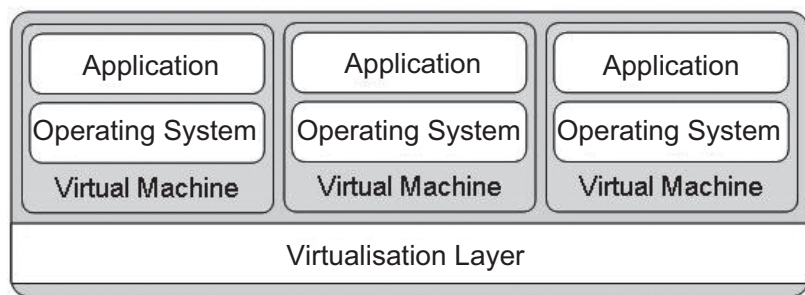

Diagram A   Diagram B

Outline **two** benefits of virtualisation.

_____

_____

_____

_____

See next page

Question 13 **(3 marks)**

The first stage of the System Development Life Cycle (SDLC) is preliminary analysis. Describe **three** methods that an organisation would use to gather data in order to understand the existing system.

_____

_____

_____

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_____

Question 14 **(7 marks)**

Analyse the following pseudocode and answer the related questions.

```
Process_student_records
    Set student_count ←0
    REPEAT
        Read student_record
        IF student_number < 999 then
            Write student_record
            Increment student_count ← student_count + 1
        ENDIF
    UNTIL student_number = 999
    Print student_count
END
```

(a)   Explain why it is important for student_count to be set to 0.   (2 marks)

_____

_____

(b)   To exit the loop, what is the result of student_number?   (1 mark)

_____

(c)   The REPEAT-UNTIL section of the code is classified as a control structure – repetition (loop). Describe how this code works and state whether it is a test first loop or a test last loop.   (4 marks)

_____

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See next page

Question 15 **(5 marks)**

Kerry needs to create a program to read a file of items that have been purchased. For each item, the file will contain the quantity of the item purchased and the cost of a single item. The program needs to calculate the total cost of the items purchased, including GST, and then calculate the shipping cost based on the total cost of the items. She has created the following mainline and program stubs for the program.

```
Module Main
TotalCost ← 0
Open Items File
Read a line (Qty, ItemCost) from Items File
    Do While not EndOfFile
        Call CalculateCostOfItems(Qty, ItemCost, CostOfItems)
        Call CalculateGST(CostOfItems, CostOfItemsPlusGST)
        TotalCost ← TotalCost + CostOfItemsPlusGST
        Read a line (Qty, ItemCost) from Items File
    End While
Close Items File
Call CalculateShipping(TotalCost, ShippingCost)
End Main
Module CalculateCostOfItems(Qty, ItemCost, CostOfItems)
Module Call CalculateGST(CostOfItems, CostOfItemsPlusGST)
Module CalculateShipping(TotalCost, ShippingCost)
```

(a) Name a parameter in the pseudocode. (1 mark)

_____

(b) Kerry has begun to create the structure chart for the program. Complete the chart to correspond to the mainline and program stubs above. (4 marks)
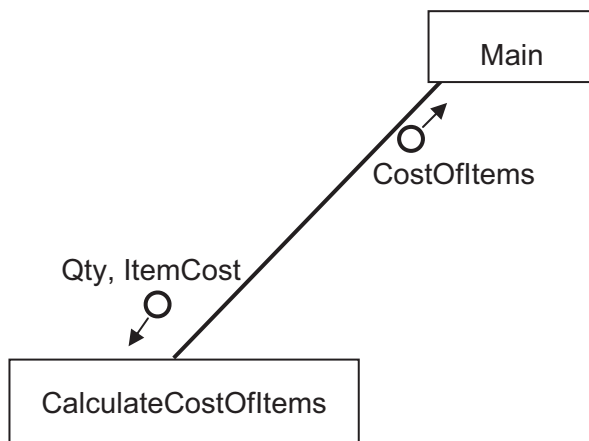
Question 16   **(9 marks)**

The following PERT chart illustrates an information technology (IT) project. Use the information to complete the Gantt chart below.

For copyright reasons this image cannot be reproduced in the online version of this document but may be viewed at www.mckinnonsc.vic.edu.au/vceit/ganttpert

Step and description	Time line is in 5 day increments (one box per 5 days). The first two lines have been completed.																	
1 BEGIN																		
2 SCHEDULE	■	■	■															
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		

Question 17   **(2 marks)**

An organisation has decided to offer its clients the ability to order online through a website. The company can either buy an existing online web-based ordering system or hire a programmer to write an online ordering system.

(a)   State **one** advantage of buying an existing system.   (1 mark)

_____

_____

(b)   State **one** advantage of hiring a programmer to write an online ordering system. (1 mark)

_____

_____

See next page

Question 18 **(2 marks)**

TCP/IP is the combination of two packet-switching protocols that work on different layers of the OSI model. Name the layers of the OSI model under which these protocols operate.

Question 19 **(2 marks)**

Software requires modification and change over time. Programmers develop software with this in mind. Name **two** techniques a programmer could use to make software easier to maintain.

Question 20 **(2 marks)**

What is the difference between CSMA/CD and CSMA/CA?

Question 21 **(2 marks)**

Fibre optic cable and twisted pair are both types of physical transmission media. Describe when an organisation would use each of these.

See next page

Question 22 **(1 mark)**

Explain why standards such as Ethernet 802.11*x* and 802.3 are important in networks.

Question 23 **(1 mark)**

What is meant by convergence of information technologies?

Question 24 **(2 marks)**

Describe **one** method used to detect errors in digital data transmission.

Question 25 **(1 mark)**

Name the device that filters and forwards packets between LAN segments.

End of Section One

See next page

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Section Two: Extended answer 60% (110 Marks)

This section contains **four (4)** questions. You must answer **all** questions. Write your answers in the spaces provided.

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Suggested working time: 110 minutes.

Question 26 **(28 marks)**

Use the case study in the **Source Booklet** to answer parts (a) and (b) of this question.

(a)   Use the information from the **Source Booklet** to create a Context Diagram for the Surfies Forever Loyalty Program System. The system boundary has been drawn for you. Complete the diagram. (6 marks)
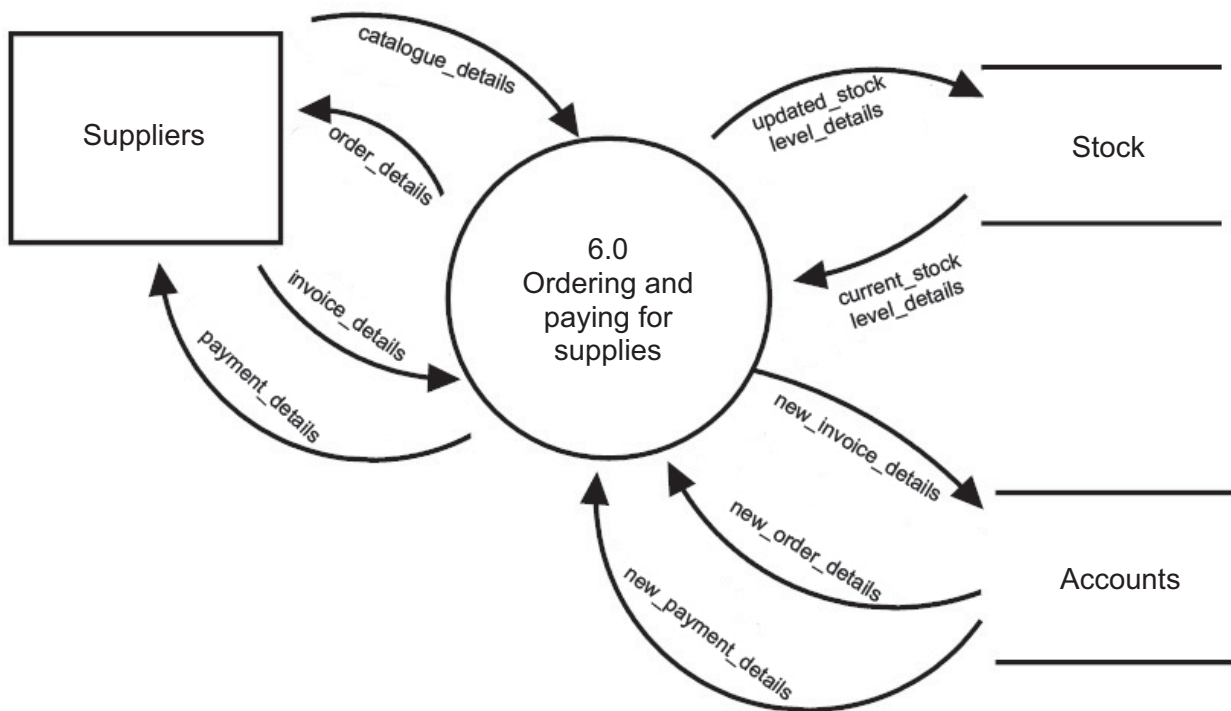
Surfies Forever
Loyalty Program
System
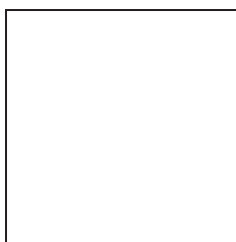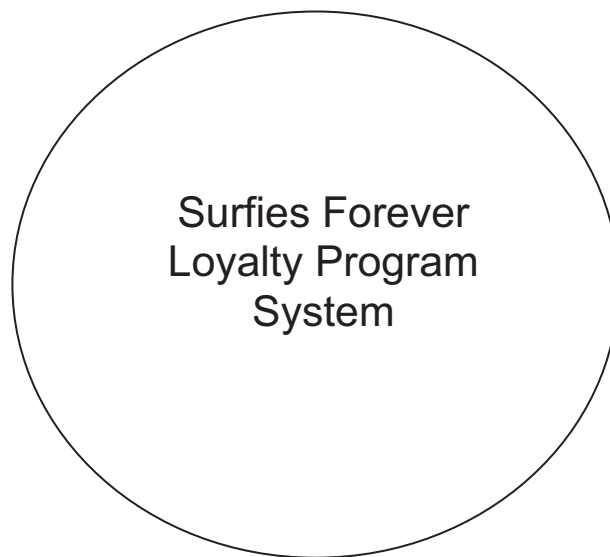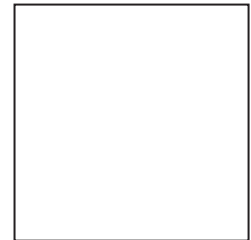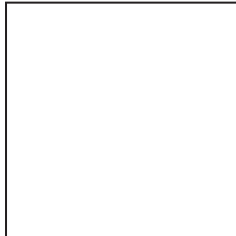
(b) From the Context Diagram you drew in (a), further develop this into a Level 0 Data Flow Diagram (DFD) below. Some of the symbols have been drawn for you.

(14 marks)
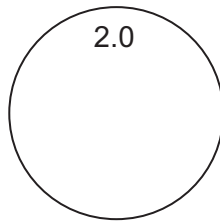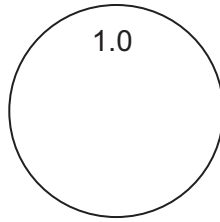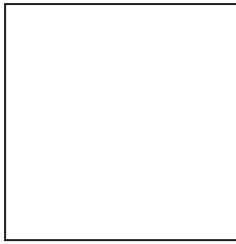
(c)   Surfies Forever orders its supplies from a number of Suppliers.   (8 marks)
* Each month Surfies Forever receives catalogues of existing and new products from its Suppliers.
* Surfies Forever checks its stock level from the Stock database to decide what is needed.
* Surfies Forever then uses the catalogue to order products each month from its Suppliers by faxing orders with the details.
* Surfies Forever receives invoices with the products and is required to pay them within 30 days.
* Surfies Forever checks that all the products have arrived and records this information in the Stock database.
* Surfies Forever also updates the Accounts database with the invoice details.
* A payment is made to pay its Suppliers.

The Level 0 DFD shown below illustrates the process for ordering and paying for supplies. In the space provided and using a number of processes, redraw this as a Level 1 DFD.

In the space provided draw your Level 1 DFD.
Note: Additional working space is provided on page 38.

Question 27 **(43 marks)**

(a) Surfies Forever is considering using a data warehouse. Explain **two** differences between a data warehouse and a database. (2 marks)

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(b) It was suggested by the database administrator that the database used for the Loyalty Program should be situated on the server of every store. However, each store will only have access to that store's membership details. Head office will distribute the newsletter, statement and voucher.

(i) What type of database system is this? (1 mark)

_____

(ii) Justify why you have identified this type of database. (2 marks)

_____

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(c)   The following data entry screens are used at each store to create and record new members, enter member purchases and update the loyalty program with the total amount and date of purchases.   (19 marks)
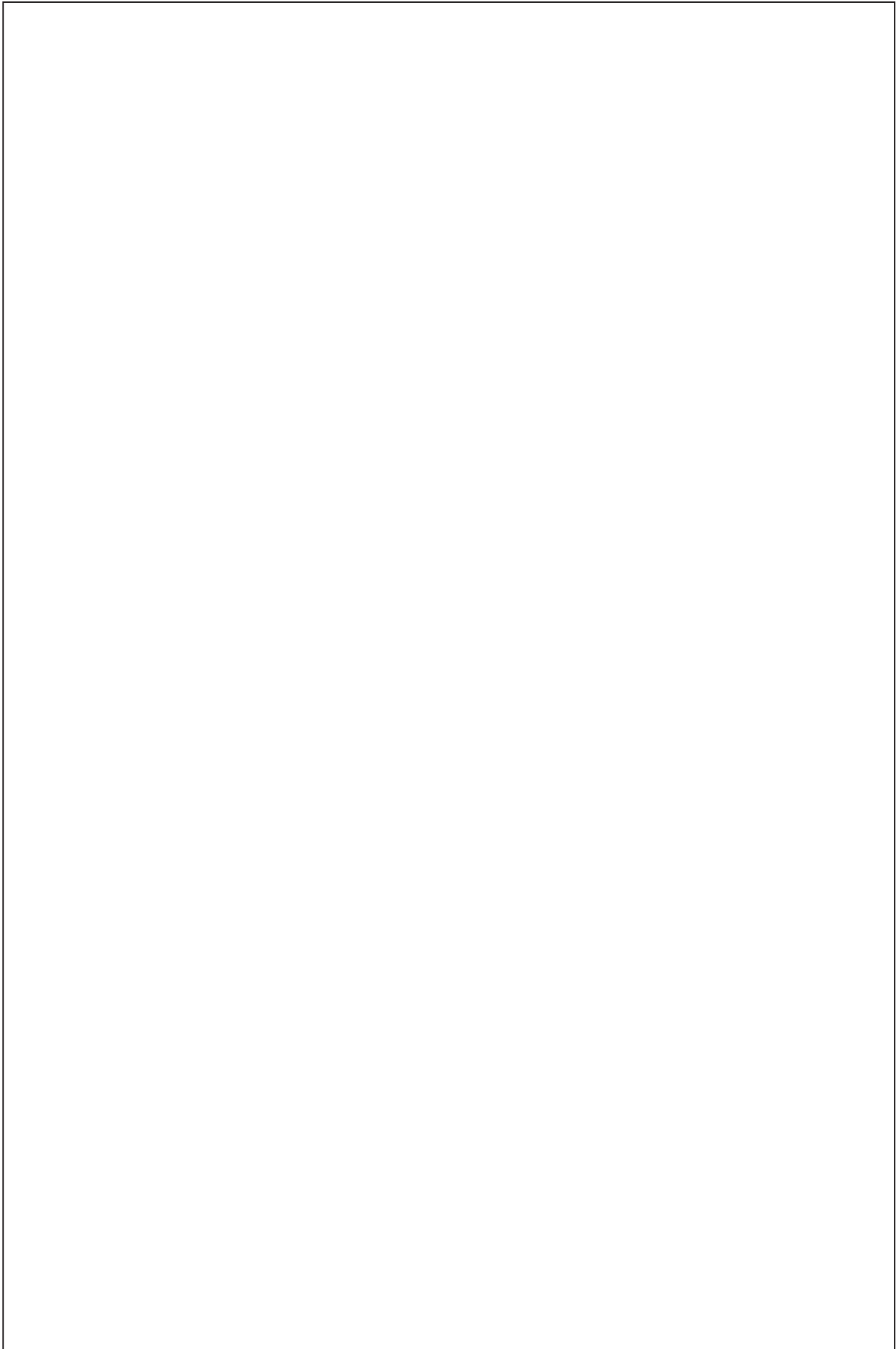
Use these data entry screens to create an Entity Relationship Diagram for the database. Include all necessary entities, attributes, primary and foreign keys, relationships and cardinality. Resolve any many to many relationships.

In the space provided create your ER Diagram.
Note: Additional working space is provided on page 39.

(d)   The managing director of Surfies Forever is interested to know whether males spend more than females in its stores.

    (i)   Name a field that you would add to the database that will give the managing director the required information.   (1 mark)

_____

    (ii)   Which entity would this new field be in?   (1 mark)

_____

    (iii)   What data type would you use for this field?   (1 mark)

_____

(e)   At present, no passwords are necessary to log onto the database. Describe **two** risks this could pose to the data stored in the database.   (2 marks)

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(f)   Describe **three** features/rules that a password should have to ensure maximum security.   (3 marks)

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See next page

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(g) The following table illustrates how the data is kept for the Suppliers and their products in the Stock database with StockID as the primary key.

StockID	Supplier	Contact	Address	Description	Colour	Date of purchase
124	SurfKit	John	1 Will Street Perth 6000	Surf Shorts	Floral	08/11/11
213	Jonies	Phil	89 Tone Street Trigg 6021	Hat	Green	01/10/11
256	Pitchet	Sue	23 Kin Street Perth 6000	Ladies Bathers	Yellow	12/10/11
298	SurfKit	John	1 Will Street Perth 6000	Keyring	Multi	09/09/11
351	Stars	Will	231 Till Street Park 6231	Thongs	Black	03/09/11
394	QuickSo	June	78 Jack Ave Midland 6054	Surfboard Wax		05/11/11
452	Staxx	Warren	7 Camp Lane Perth 6789	Pens	Multi	14/10/11
469	SurfKit	John	1 Will Street Perth 6000	Ladies Bathers	Floral	24/10/11
512	Stars	Will	231 Till Street Park 6231	Mens board shorts	Orange	03/10/11

(i) The supplier known as SurfKit has changed its address to 15 Jackson Street, Lesmurdie 6125. Use the data in the table to describe **one** potential problem in changing this information in the database. (1 mark)

(ii) A new supplier known as PenGrip, with the contact Mike and the address 14 Collins Street, Perth 6000, needs to be added to the database. Use the data in the table to describe **one** problem that might arise when including this new supplier. (1 mark)

See next page

(iii) Normalise the data in the table on the previous page and create an Entity Relationship Diagram that will ensure that these potential problems do not occur. Include the entities, relationships, primary keys and foreign keys as necessary.

(9 marks)

Question 28 **(22 marks)**

(a) The following table outlines how the voucher value is calculated, based on the total amount purchased in a month.

Member spends	Voucher received
Less than $50.00	No voucher is sent to member. The amount is carried over to the following month
Greater than or equal to $50.00 and less than $100.00	5% of the total amount spent
Greater than or equal to $100.00 and less than $500.00	10% of the total amount spent
Greater than or equal to $500.00	12% of the total amount spent

(i) What programming control structure would be most appropriate to use to calculate the voucher amount? (1 mark)

(ii) Write the pseudocode required to calculate the amount of a voucher for a member, using the information from the table. The member's purchase total for the month is stored in a variable named MTPurchases and the voucher amount should be placed in MVAmount. (6 marks)

(b)   The pseudocode below indicates to Surfies Forever what the average voucher amount is at the end of the month. Using the voucher values $50, $40 and $30, create a trace table to test the algorithm. Column headings need to be included.   (7 marks)

```
TVAmount←0
AVAmount←0
VIndex←1
WHILE (elements in the array)
    TVAmount ←TVAmount + VAmount [VIndex]
    VIndex ← VIndex + 1
END WHILE

AVAmount ← TVAmount/(VIndex -1)
```

		VIndex

(c) Surfies Forever has a program that is used for the ordering of supplies. The Stock details are stored in a record with the following format. (8 marks)

Record Structure
StockData
StockID
StockDescription
StockSize
StockColour
StockType
StockQOH
StockLastUpdateDate

StockQOH is the Quantity on Hand (QOH) for the stock item and stores the number of items in Stock at any one time.
Two global variables have been defined.
• GStockID holds the StockID of the item currently being considered.
• GStockQOH will hold the Quantity on Hand for the StockID stored in GStockID.

Write the pseudocode for a module called GetStockID that will use the global variable GStockID to read through the StockData records and find the record that corresponds to GStockID. When it finds that record, it should place the StockQOH for that record into GStockQOH.

The first line has been done for you.

MODULE GetStockID() _____

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See next page

Question 29 **(17 marks)**

Surfies Forever is modernising its business and is looking to inter-network its five stores. The Scarborough store will hold the main database server for the business. In addition to the inter-networking of stores, Surfies Forever intends to use a centralised web system that will have ordering capability, stock control and the ability to process credit card payments.
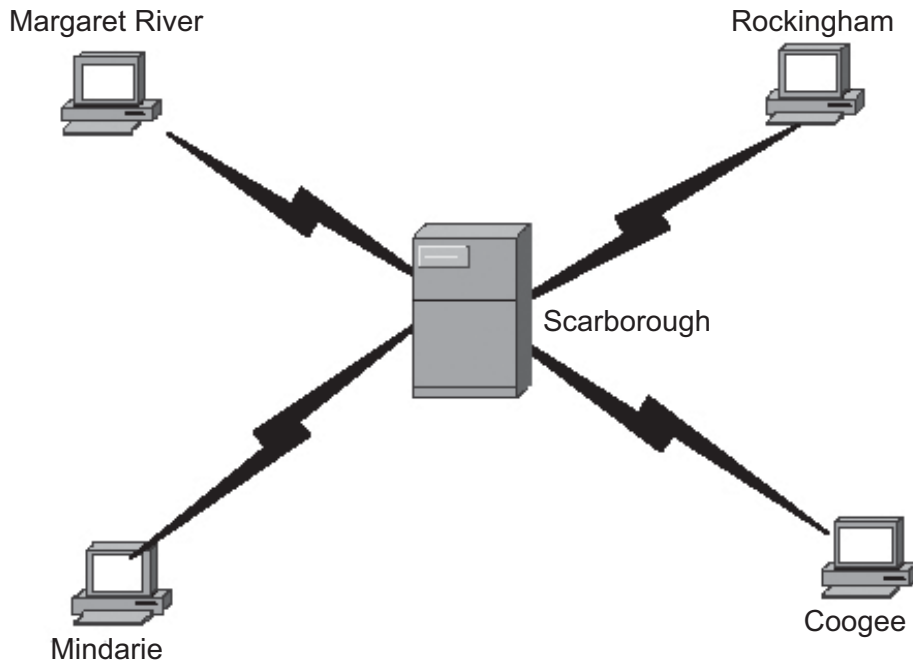
(a)   Consider the logical diagram above. Name the network topology that best describes it.

(1 mark)

_____

(b)   The links between each of the stores is to be an ADSL2+ connection. However, the Margaret River store is over 4 km from the local telephone exchange. Due to the attenuation of signal in copper wires, it is not possible to supply a fast ADSL2+ connection.

(i)   What is attenuation? (1 mark)

_____

(ii)   What effect would attenuation have on the ability to carry bandwidth? (1 mark)

_____

_____

See next page

(iii)   Outline **two** methods used to overcome attenuation.   (2 marks)

(c)   Describe **two** advantages that Surfies Forever will experience by inter-networking its five stores.   (4 marks)

(d)

(i)   It has been suggested that Surfies Forever inter-network all five stores over a long weekend, instead of one at a time. What type of implementation strategy is this classified as?   (1 mark)

(ii)   Outline **two** other implementation strategies Surfies Forever could have used.
                                                                                          (2 marks)

(e)   Some of the office staff would like to work from home. All staff have desktop computers at home but no access to the internet. The computers all have high-speed USB ports.

Outline **two** essential hardware or software items needed by the office staff to make safe, secure connections to the internet from home. Justify your decision for the inclusion of **one** of these items. (3 marks)

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(f)   Surfies Forever is unsure how to backup its centralised web system efficiently. Two suggestions are to use an incremental backup and a full backup.

Explain when these backup strategies would be used. (2 marks)

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End of questions

Question number: _____

Question number: _____

Question number: _____

Question number: _____

Additional working space

Additional working space