Edith Cowan University

2023 ATAR Revision Seminar

ATAR Computer Science
Units 3 and 4
Solutions to Exercises

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Contents

System Analysis

Project management

### Exercises

Question 1

Jane has been hired to develop a new online sales system for RedTree, an online trading platform for people to buy and sell used goods. She has developed the following timeline for the tasks that need to be completed.

Task ID	Task Name	Duration – days	Dependency
1	Interview management	3 days	
2	Develop Context Diagram	1 day	1
3	Develop DFD	1 day	2
4	Develop un–normalised data sheet	1 day	1
5	Normalise data to 3NF	1 day	4
6	Develop ERD	1 day	5
7	Interview Salespeople	1 day	1
8	Develop Application	4 days	7
9	Develop Database	2 days	3,6, 8
10	Install Hardware	2 days	9
11	Install Application and Database	2 days	10
12	Test	1 day	11

a)   Draw a Gantt chart for this project based on the information in the table above.
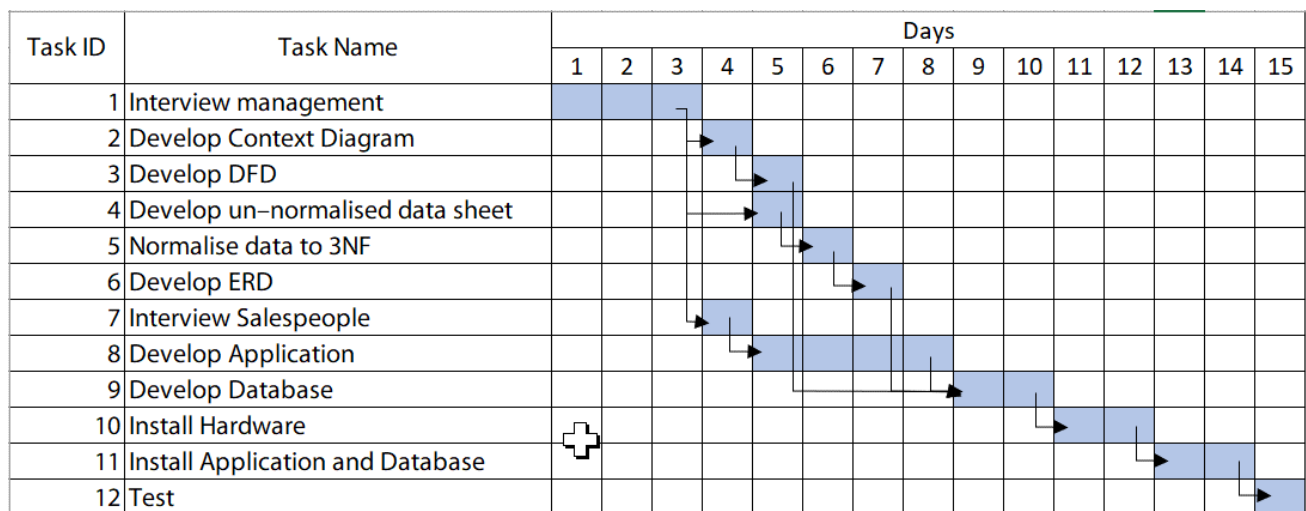
b)   Draw a PERT chart for this project based on the information in the table above.
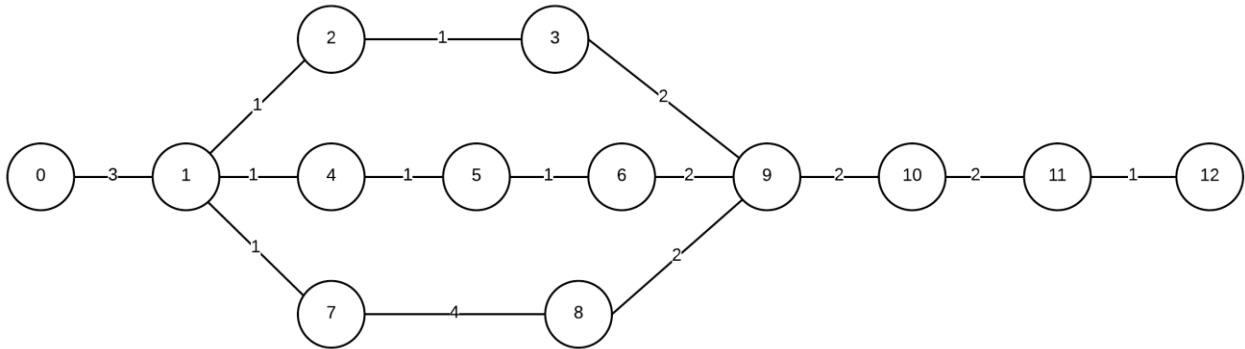
c)   How long will it take to complete this project?
15 days

d)   What is the critical path for this project?
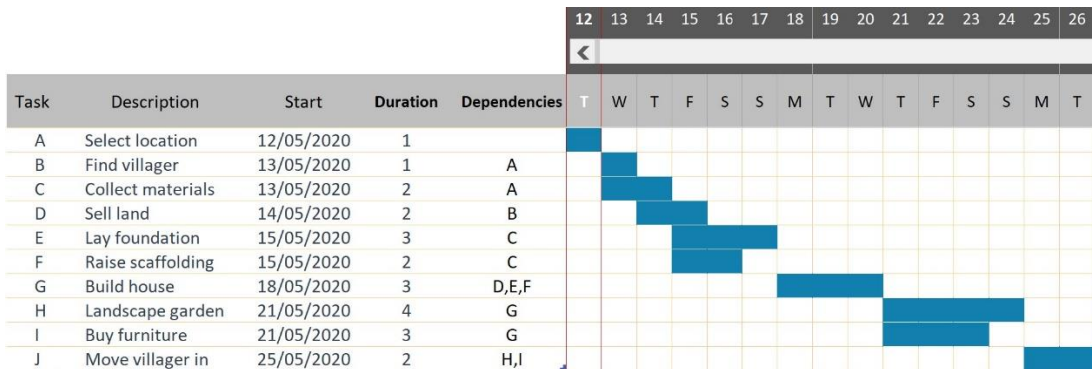1 – 7 – 8 – 9 – 10 – 11 - 12

e)   The system is more complex than Jane anticipated, and it has taken her 3 days to develop a DFD. How
     will this affect the critical path of the project?
This will not impact the critical path as task 3 has 3 days slack time. (Tasks 1 – 2 – 3 – 9 should take 7 days,
Tasks, 2 – 7 – 8 – 9 should take 10 days, so an extra 3 days for task 3 will mean both sets of tasks will take 10
days)

Question 2

Elisabeth loves her new game "Animal Junction" in which she must complete tasks to help villagers move to
her virtual island. She is so obsessed with collecting new villagers that she has created a Gantt chart to help
her complete the tasks as efficiently as possible.
Refer to the Gantt chart below to answer all parts of this question.

Task	Description	Start	Duration	Dependencies	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
					T	W	T	F	S	S	M	T	W	T	F	S	S	M	T
A	Select location	12/05/2020	1		▮														
B	Find villager	13/05/2020	1	A		▮													
C	Collect materials	13/05/2020	2	A		▮	▮												
D	Sell land	14/05/2020	2	B			▮	▮											
E	Lay foundation	15/05/2020	3	C				▮	▮	▮									
F	Raise scaffolding	15/05/2020	2	C				▮	▮										
G	Build house	18/05/2020	3	D,E,F							▮	▮	▮						
H	Landscape garden	21/05/2020	4	G										▮	▮	▮	▮		
I	Buy furniture	21/05/2020	3	G										▮	▮	▮			
J	Move villager in	25/05/2020	2	H,I														▮	▮

(a) Convert the above Gantt chart into a PERT chart. Draw it in the space below.
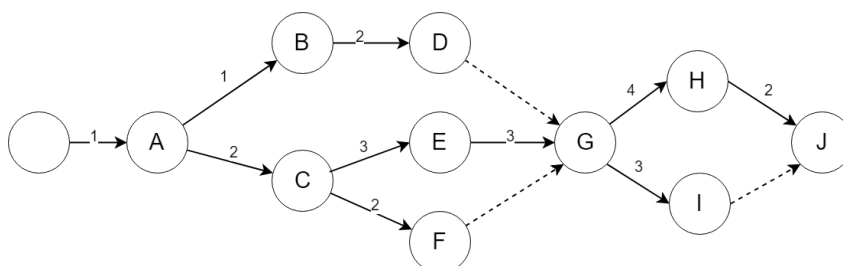
(b) Identify the critical path for this project.
A – C – E – G – H – J

(c) Explain how each of the following would affect the completion time for the project.

Laying the foundation takes 1 additional day.
The entire project would take an extra day because this task is on the critical path.

Finding a villager takes 2 additional days.
This won't affect the overall completion time because task B has 2 days slack time.

Development Documentation

Exercises

Question 1

JSV Banking is a regional bank that currently has branches throughout Western Australia. After several successful years of operating in regional WA, they would like to expand their operations and open offices throughout regional Australia. In order to make sure that they expand in a sustainable way and do not overstretch themselves, they would like to conduct a review of their current practices and find areas they can improve

As part of their strategy to increase their customer base, JSV Banking have decided to offer a special deal on home loans to new customers – current customers will not be eligible for this deal!

In order to get this deal, potential customers fill out an initial online application to make an appointment with a bank officer. This information will be used to check the customer database to verify that the applicant does not have any existing accounts with the bank. If the applicant does have an existing account an existing customer rejection notification will be sent, otherwise an appointment notification will be sent to the new customer.

The customer will then make an appointment with a bank officer who will complete a loan application with the customer. As part of this application, the bank officer will send the customer details to an external credit reporting agency to find out their current credit rating. If the customer credit rating is poor then the loan request is rejected and a poor credit rating notification is sent to the customer. If the credit rating is good the customer is notified that they have preliminary approval for a loan so can put in an offer on the property they would like to purchase.

Once they put an offer on a property, the customer sends the bank officer the details of the property and the bank officer fills out a property valuation request form. This valuation request form is sent to an independent valuer who completes a valuation report and sends this back to the bank.

The valuation report is used to determine the final loan amount and a home loan contract is drawn up and sent to the customer. The valuation amount is recorded in the customer database. The valuation report is stapled to a copy of the contract and placed in the pending loan file.

If the customer is happy with the loan details, they sign the contract and send it back to the bank. The bank officer creates the new loan account and the actioned contract is placed into the current loan file. A letter outlining the loan account details is sent to the customer.

(a) Draw a Context Diagram for the system described above.
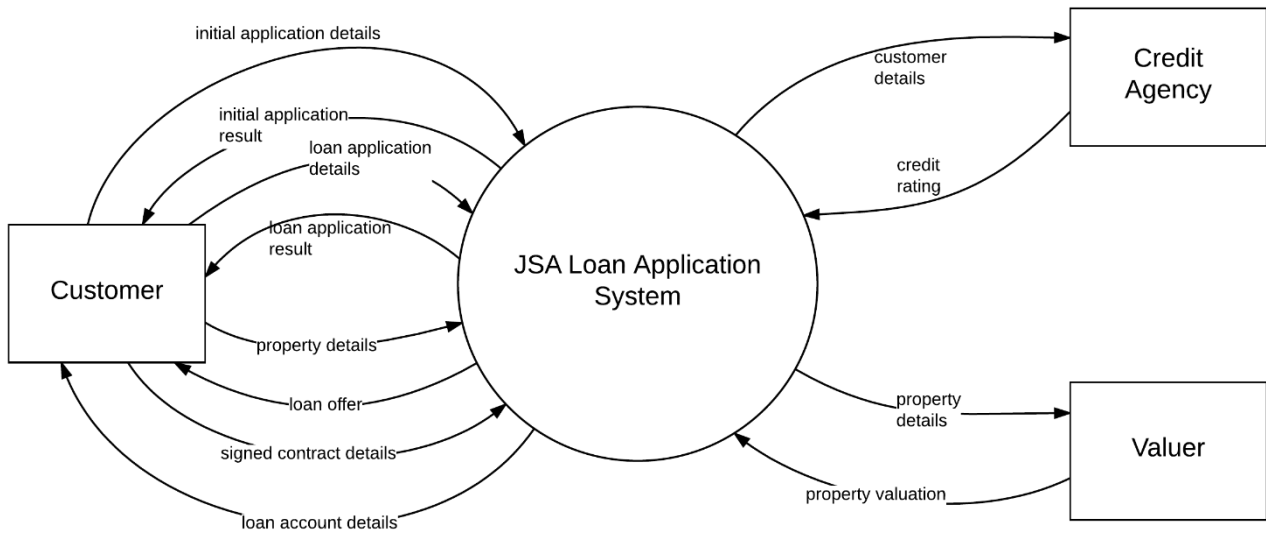
(b) Draw a Level 0 Data Flow Diagram (DFD) for the system described above.
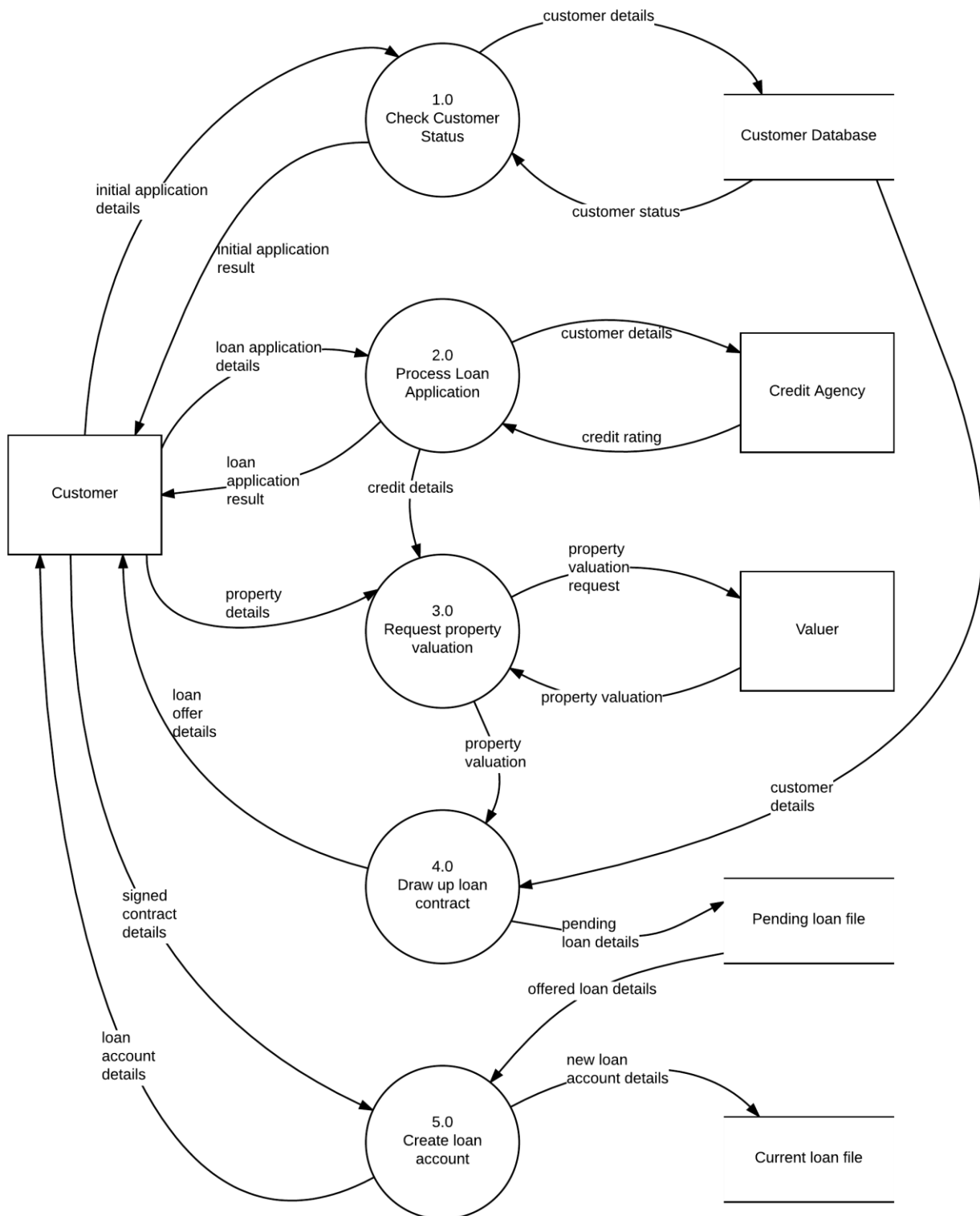
Question 2

Vikki is developing an online ticketing system that will allow users to login and purchase tickets from their mobile devices.

During the registration process the user will enter their details into the system. These details will then be checked to ensure they are valid and, if valid, will be entered in the Customers Database. Registration details will then be sent to the user to allow them to login. When logging in, the username and password will be entered and checked against the Customers Database. If the details are correct, a response will be sent to the user confirming that login was successful.

The following partial level 0 Data Flow Diagram describes the customer registration process for Vikki's app.
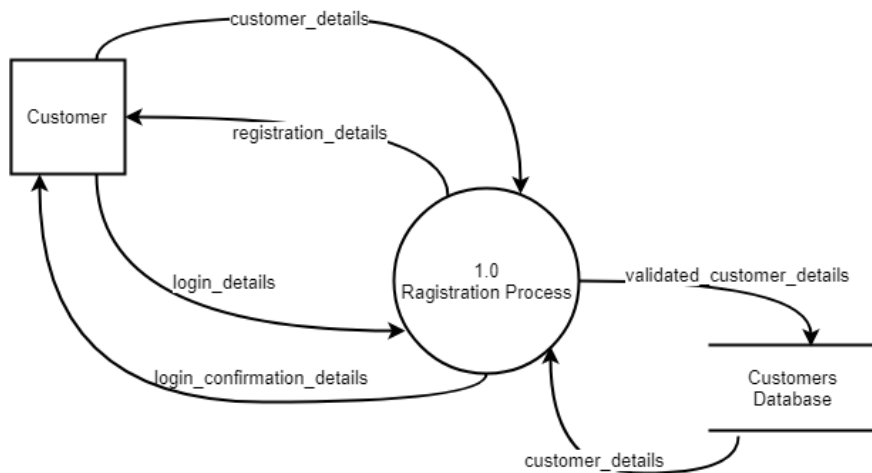
Level the Level 0 Data Flow Diagram above into a Level 1 Data Flow Diagram.
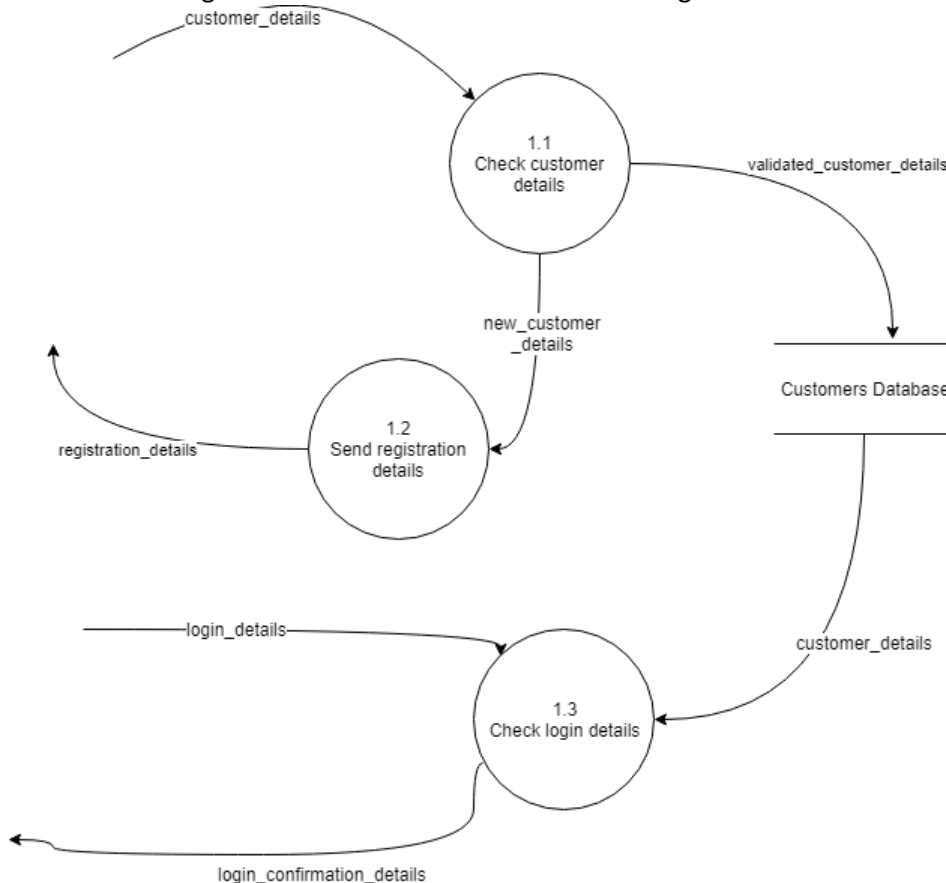
Managing Data

Database Concepts

Exercise

Table: Cabin				
cabin_id	name	beds	bathrooms	pets
1	Eagle	4	1	Yes
2	Wren	4	1	No
3	Parrot	8	2	No

Table: Customer			
customer_id	first_name	last_name	email
1001	Jenny	Lane	jenny88@hmail.com
1027	Max	Peterson	peterson@yipee.com
1384	Allan	Fowler	afowler@hmail.com.au

Table: Booking				
booking_id	date_in	date_out	customer_id	cabin_id
56852	11/10/2020	14/10/2020	1001	1
57823	15/12/2020	26/12/2020	1384	3
69825	16/12/2020	20/12/2020	1001	1

Using examples from the tables above, describe the following data integrity terms.

(a) Referential integrity:
Referential integrity ensures that all foreign keys in a table match an existing primary key in the linked table. For example, when making a new booking, the customer_id recorded in the Booking table must exist as a valid customer_id in the Customer table.

(b) Domain integrity:
A domain defines the possible values of an attribute. Domain integrity governs the values to ensure that they satisfy the rules. They may such things as the data type and length, whether or not to accepts NULL values, the default value and the acceptable values mandated through constraints or validation rules. For example, the date-in must be either the current date or a future date within 1 year.

(c) Entity Integrity:
Entity integrity is the concept that in a relational database system all records must contain an identifying field called a primary key and the value of this field must be unique within the table such that the record is not confused with others. For example, each record in the Booking table has a unique booking_id that will allow that booking to be identified.

Normalisation

Exercises

Question 1

Mt Barker High School has recorded the results from its annual swimming carnival in an Excel spreadsheet. An extract of that spreadsheet is below. (NOTE: Each student can only be a member of one team and can only compete in one age group).

Event	Age	Gender	Distance	Stroke	Competitor	Team	Time	Place	Points
1	U/13	M	50m	Freestyle	David Leblanc	Dolphins	00:32.9	1	16
1	U/13	M	50m	Freestyle	Barry Hu	Eels	00:36.3	2	13
1	U/13	M	50m	Freestyle	Thomas Black	Sharks	00:40.6	3	11
35	U/17	M	100m	Breaststroke	Jacob Morris	Eels	01:24.7	5	8
35	U/17	M	100m	Breaststroke	Chase Sanders	Dolphins	01:33.1	6	7
35	U/17	M	100m	Breaststroke	Oliver Hahn	Sharks	01:41.0	7	6
35	U/17	M	100m	Breaststroke	Simon Wood	Rays	01:51.2	8	5
55	U/21	M	100m	Breaststroke	Brett Hobbs	Eels	01:15.6	1	16
55	U/21	M	100m	Breaststroke	Eric Lee	Rays	01:18.5	2	13
55	U/21	M	100m	Breaststroke	Barry Stokes	Sharks	01:32.9	5	8
63	U/21	M	100m	Backstroke	Brett Hobbs	Eels	01:12.5	2	13
63	U/21	M	100m	Backstroke	Brendan Serrano	Dolphins	01:13.2	3	11
63	U/21	M	100m	Backstroke	Barry Stokes	Sharks	01:18.1	6	7
63	U/21	M	100m	Backstroke	Eric Lee	Rays	01:21.4	7	6

Normalise the data to third normal form (3NF). Give your answer in the form of relation definitions.

Event(EventID, Age, Gender, Distance, Stroke)
Competitor(CompetitorID, FirstName, LastName, TeamId FK)
Team(TeamId, Name)
CompetitorEvent(CompetitorID FK, EventID FK, Time, Place FK)
Place(Place, Points)

Question 2

The following excerpt shows data that is stored by a bank manager about the customer accounts that he oversees.

Customer ID	Customer Name	Account Number	Account Type	Product Name	Current Balance	Interest Rate	Date Opened	Opened By	Branch
10191	David Burgess	4485 6737 9486 1104	Credit card	Blue VISA	$50,470.96	21.40%	Dec 23, 2016	Finn Compton	Broome
10191	David Burgess	51931146	Home Loan	Investment One	$25,611.30	5.24%	Dec 20, 2016	Margaret Wilkins	Broome
10191	David Burgess	79573746	Savings	Everyday Savings	$88,647.49	0.01%	Apr 20, 2018	Margaret Wilkins	Broome
10191	David Burgess	41425482	Home Loan	First Homebuyer	$26,173.15	4.03%	Aug 26, 2017	Margaret Wilkins	Broome
10228	Alice Green	89818296	Savings	Saver Plus	$85,739.02	0.50%	Dec 16, 2017	Adele Perry	Dunsborough
10228	Alice Green	54456999	Savings	Everyday Savings	$25,060.73	0.01%	Jan 26, 2018	Adele Perry	Dunsborough
10228	Alice Green	73663187	Home Loan	Investment One	$47,096.15	5.24%	Dec 16, 2016	Adele Perry	Dunsborough
10393	Stephanie Cunningham	5211 7675 1802 1926	Credit card	Platinum MasterCard	$69,794.45	21.60%	Jul 8, 2017	Hadley Nguyen	Karratha
10393	Stephanie Cunningham	66678786	Savings	Saver Plus	$87,059.64	0.50%	May 28, 2017	Hadley Nguyen	Karratha
10393	Stephanie Cunningham	52787122	Home Loan	Investment One	$1,288.30	5.24%	May 12, 2018	Margaret Wilkins	Broome
10409	Mercedes Hendricks	61193735	Savings	Saver Plus	$22,718.79	0.50%	Feb 9, 2017	Finn Compton	Broome
10589	Emily Goodwin	81269568	Home Loan	First Homebuyer	$3,904.93	4.03%	May 7, 2017	Margaret Wilkins	Bunbury
10591	Wayne Carter	84313126	Home Loan	Investment One	$88,073.16	5.24%	Dec 14, 2017	Margaret Wilkins	Bunbury
11011	Neville Moran	4929 4031 8905 9823	Credit card	Blue VISA	$71,916.91	21.40%	Dec 25, 2017	Adele Perry	Dunsborough

(a) Insert anomaly

Insert anomalies can occur in data that has not been normalised to third normal form. There are two types of insert anomaly:
- When data needs to be added to a table and not all the data is known then some fields will be null.
- When data is added to a table and this results in some data being repeated.

For example, if Neville Moran opened another savings account, his details would need to be repeated.

(b) Delete anomaly

The deletion anomaly can occur in data that has not been normalised to third normal form. A deletion anomaly occurs when a record is deleted and this results in the loss of other data that only occurs in that record

For example, if Mercedes Hendricks closed her accounts and those records were deleted, the data about Finn Compton (an Employee) would also be lost.

(c) Update anomaly

An update anomaly is a problem that occurs when data that is repeated in a number of records requires updating. If all records are not updated the data could become inconsistent or inaccurate. This repeated data is often found in data that has not been normalised to third normal form.

For example, if Alice Green got married and decided to change her name, then three records would need to be updated.

(d) Normalise the data to 3rd Normal Form (3NF)
Customer(CustomerID, FirstName, LastName)
CustomerAccount(AccountID, CustomerID FK, AccountType FK, BranchID FK, OpenedBy FK, Balance,
          DateOpened)
AccountType(AccountTypeID, Type, Name, InterestRate)
Branch(BranchID, City)
Employee(EmployeeID, FirstName, LastName)
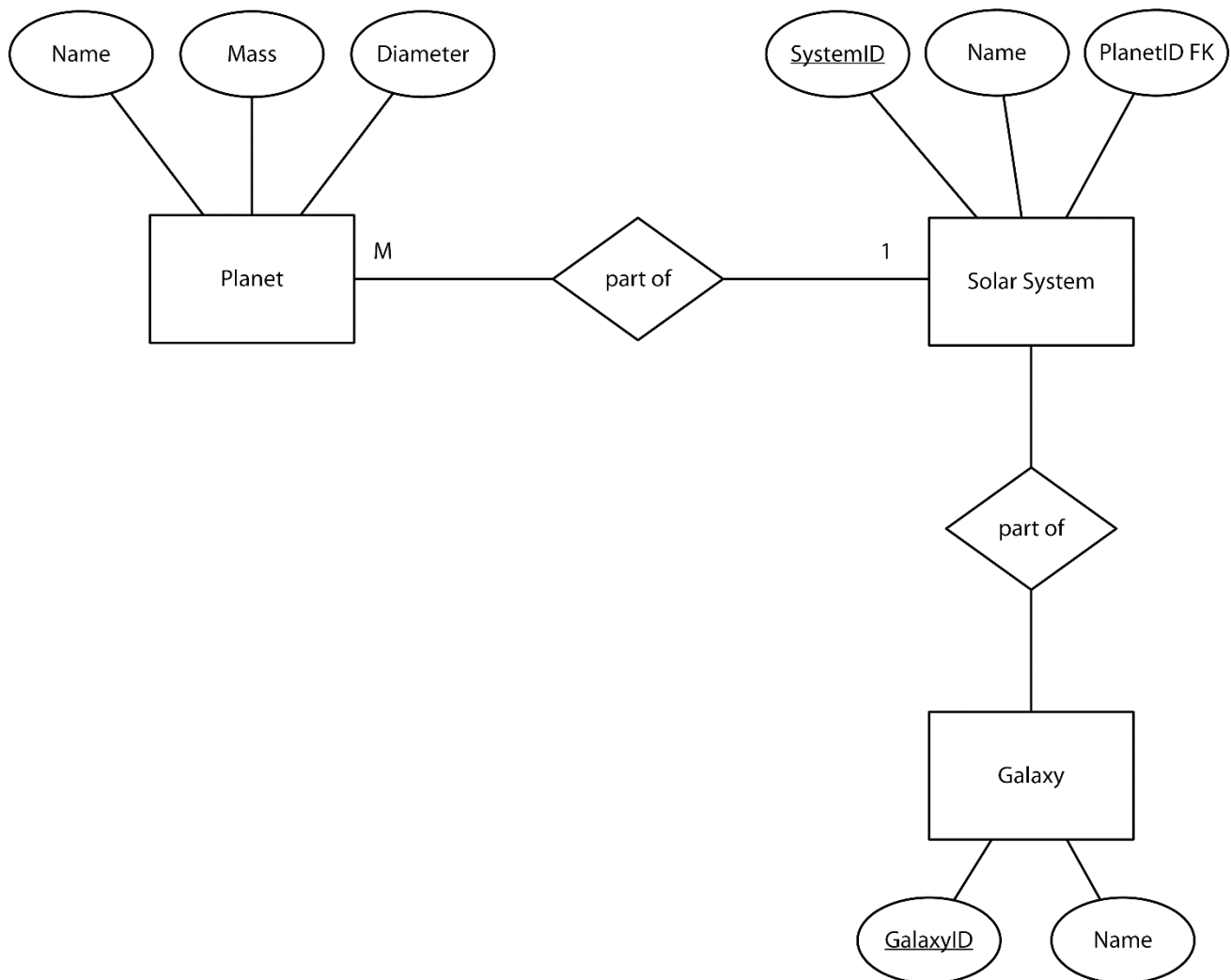
Entity Relationship Diagrams

Exercises

Question 1

Consider the following relationships.

- A solar system is made up of many planets.
- Many solar systems make up a galaxy.

Identify and describe four errors in the Entity-Relationship Diagram (ERD) below.

Errors include:

- No cardinality between Solar System and Galaxy
- Foreign key between Planet and Solar System should be on the Planet side of the relationship
- No Primary key for Planet entity
- Should be a foreign key on Solar System for relationship with Galaxy (eg. GalaxyID FK)s

Question 2

JSV Banking has a dedicated IT department based at their head office in Bunbury and would like a database to keep track of all the projects that each employee is working on. The IT department is made up of several different sections (for example, Web Development) and each section will have multiple projects running at any one time. For most projects, more than one employee will be needed, and each employee will need to divide their time across several different projects. Each employee will also work in a specific section of IT, however, may be assigned to projects across several different sections as needed.

Draw an Entity Relationship Diagram (ERD) to model the required database. You should include all relationships, primary keys and foreign keys, attributes and resolve any many to many relationships. (15 marks)
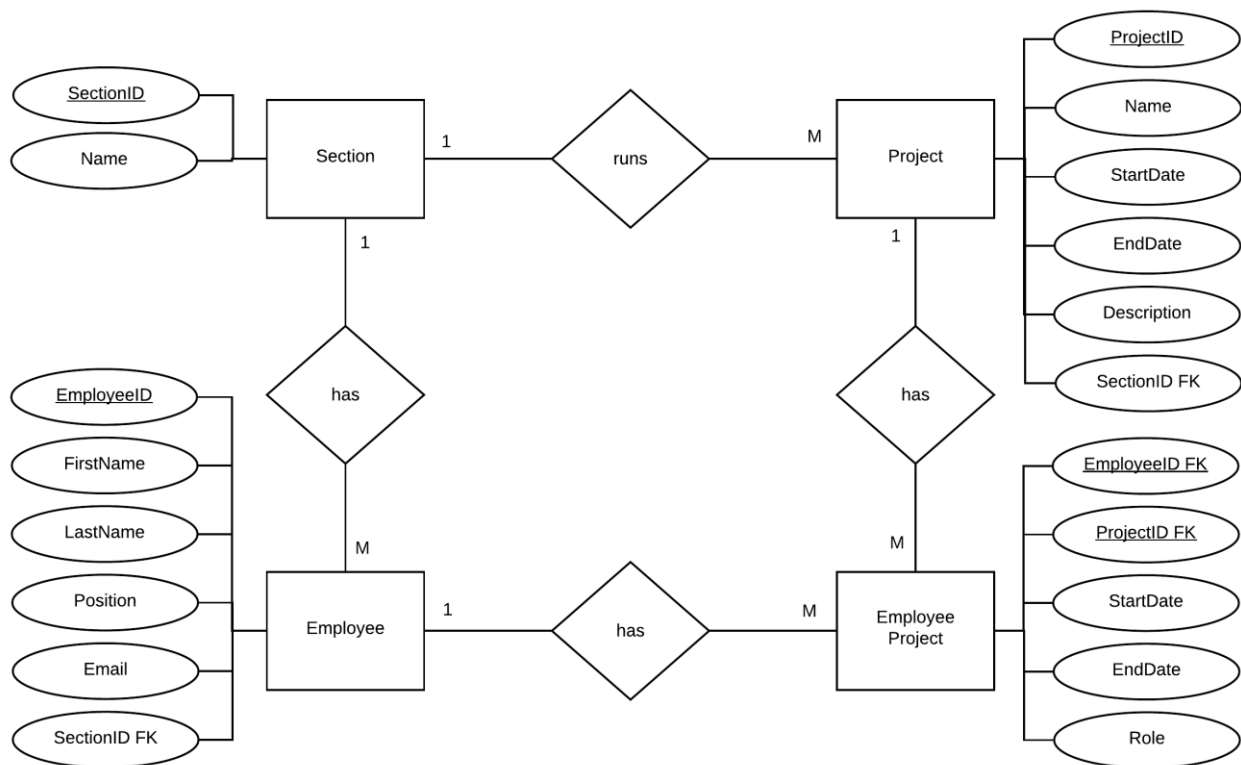
Question 3

Jake has started a Home Maintenance business that provides maintenance and gardening services to people throughout Perth. When a customer requests a job, he looks through his list of sub-contractors and allocates the job to the most suitable person.

When the job is completed, the customer is issued with an invoice (such as the one shown in the image below). Currently he uses an Excel spreadsheet to create each invoice, but as his business has grown, he has found it increasingly time consuming to create each invoice. To solve this problem, Jake has decided to upgrade his invoicing system to use a database to store all the necessary data.

Jake's Home Maintenance and Garden Services ABN:5684 599 214		INVOICE	
		Invoice Num	INV0018656
		Date	15/07/2020
Customer:	Peter Jones	**Customer ID**	CUS1985768
Address:	14 Bell Rd		
	Claremont, WA, 6010		
Phone:	0458 684 286		
Email:	pjones@eenet.net.au		
Contractor:	John Smith		

Qty	Description	Unit Price	Line Price
100	Pickets for fence	$5.75	$575.00
2	White paint	$58.00	$116.00
1	Wood treatment	$75.00	$75.00
8	Labour	$80.00	$640.00

Subtotal	$1,406.00
GST	$140.60
Total	$1,546.60

Payment must be made within 7 days of the invoice date.

Using the information on the previous page, draw an Entity-Relationship Diagram (ERD) to show how his new database will be structured. Resolve any many-to-many relationships and include all necessary attributes.

Possible solutions

Version 1:
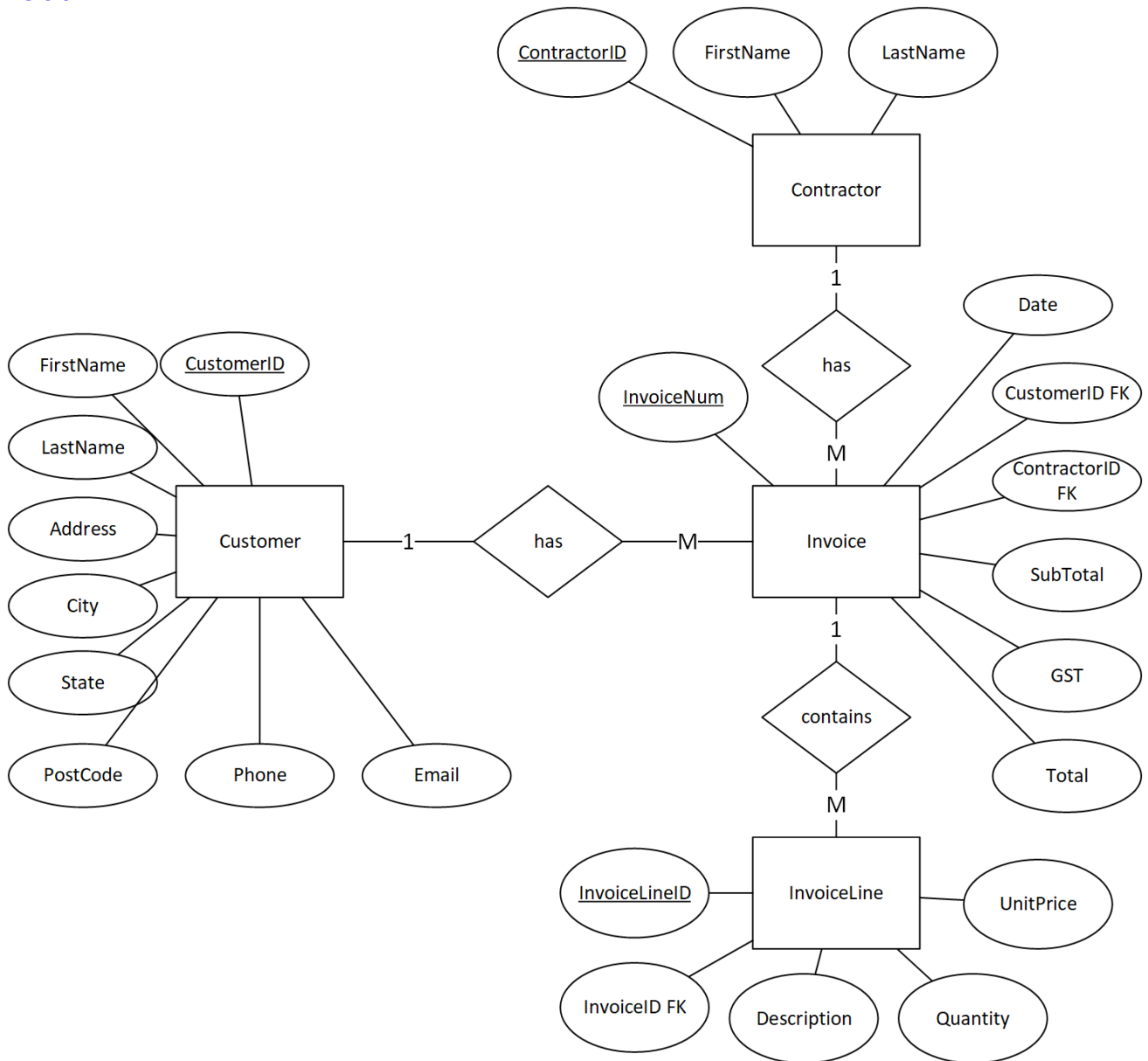
Version 2:
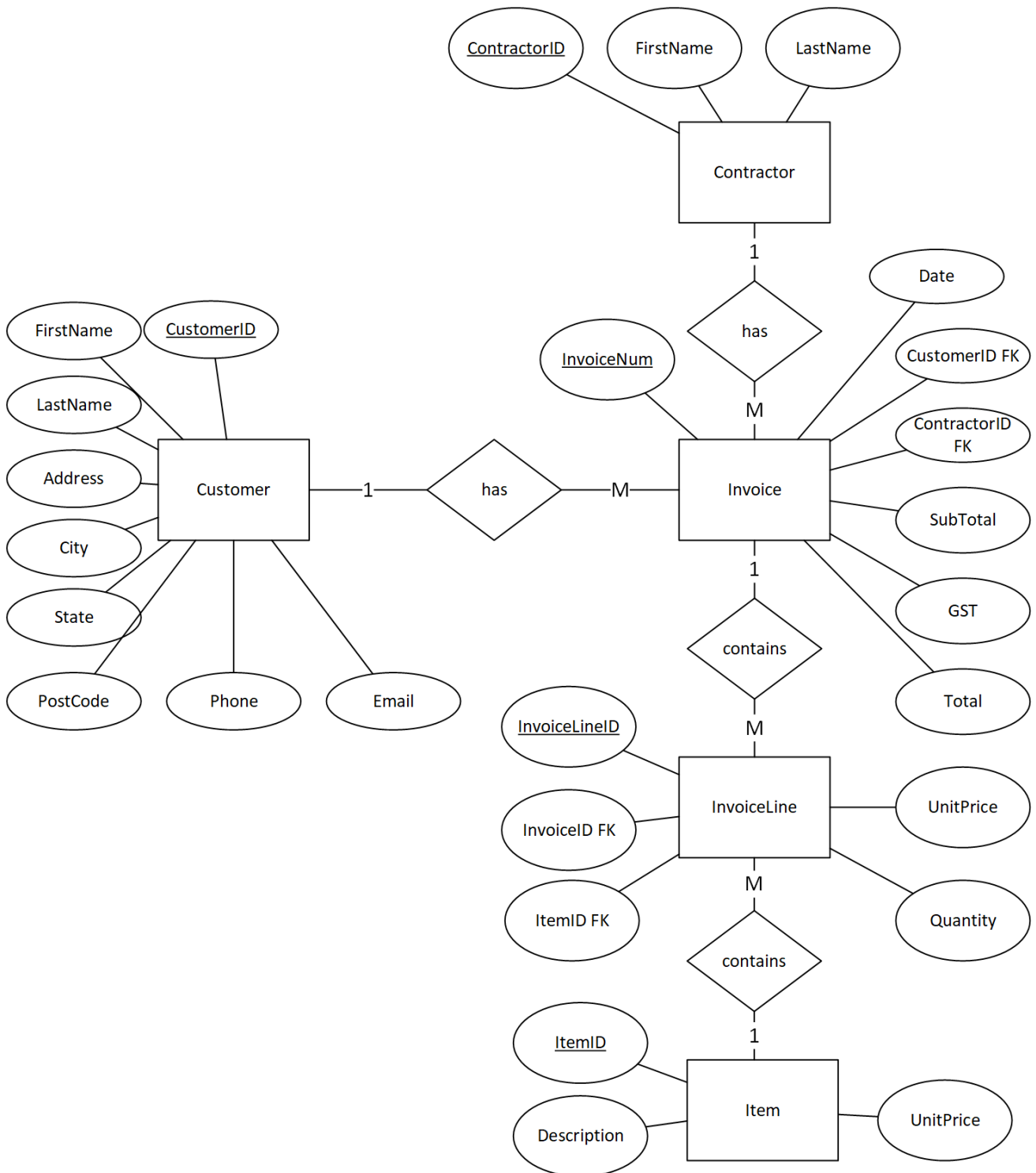
NOTE: For solution 2, the Item for each InvoiceLine has been moved to a new entity. This allows for the same item to appear in multiple invoices. The UnitPrice is in both the Item and InvoiceLine as this allows for the business case where the UnitPrice might change over time, or a special discount might be given for a specific order.

The Invoice entity also has two calculated fields which are not strictly necessary (the SubTotal and Total can be calculated from information already in the database). This is useful from a business case, however, as this allows customers to be given a discount.

Question 4

The local computer gaming club wants to start a database of all the games that its members have participated in. They want to keep track of the member's details, the details of each game, and the date, time and score for each game that the member played. They have provided you with this partial Entity Relationship (ER) Diagram. Resolve the diagram, including any primary and foreign keys that may be necessary.

```
┌──────────────┐                      ┌──────────────┐
│              │        ╱◇╲           │              │
│    Member    │──M────◇plays◇────M──│     Game     │
│              │        ╲◇╱           │              │
└──────────────┘                      └──────────────┘
```

```
  (FirstName)      (LastName)      (Email)

  (MemberID)       ┌────────┐      (Phone)
                   │ Member │
                   └────────┘
                        │
                        1
                        │
                       ◇plays◇
                        │
                        M                    (Date)
  (MemberID (FK))  ┌────────────┐
                   │ MemberGame │            (Time)
  (GameID (FK))    └────────────┘
                        M                    (Score)
                        │
                   ◇belongs to◇
                        │
                        1
  (GameID)         ┌────────┐      (Genre)
                   │  Game  │
  (Name)           └────────┘      (Publisher)
```
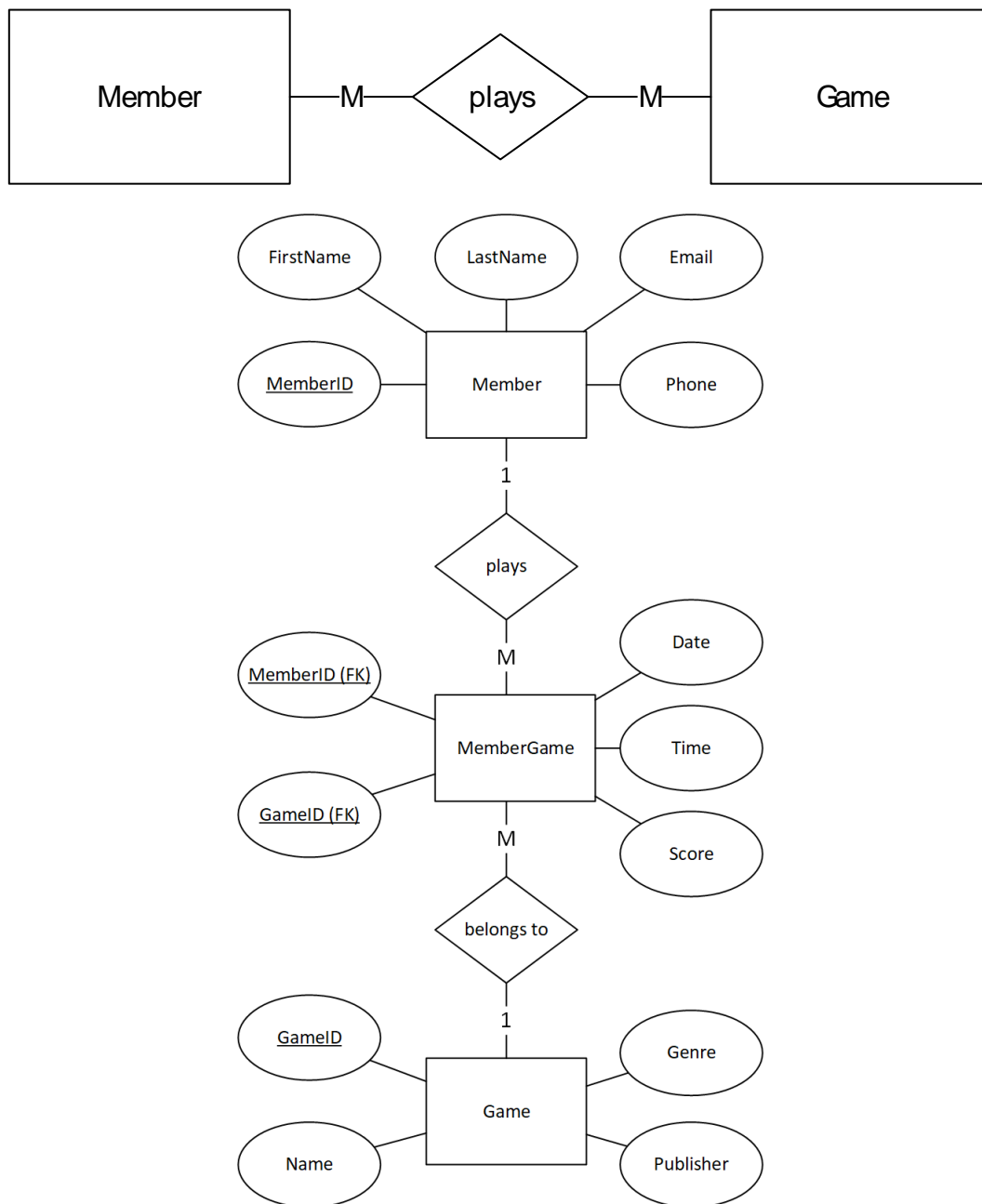
Legal/Ethical Issues

Exercise

Question 1

Peter owns a second-hand car dealership with a yearly turnover of approximately $3 million dollars. He collects, stores and disposes of car registration and drivers licence data as a normal part of selling cars. The registration and licence data that he collects is saved to a flash drive so he can easily exchange it with an insurance dealer he knows so that his friend can sell insurance to people how have just bought a car.

(a) Explain two ways that Peter may be breaking the law.

Issues could include:
- Not storing data securely (flash drive is could easily be lost so not secure)
- Giving private customer data away
- Has not got permission from customers to use their data in this way

(b) Explain one ethical issue with what Peter is doing.

Ethical issues could include:
- Breaking trust of customers who have given him their data in good faith
- Should ask customers if they are interested in getting insurance and being contacted by an insurance broker

Question 2

AussieToys is an online toy store that sells Australian made toys across the world. As part of their sales process, they collect information about each of their customers so they can personalise the shopping experience for each customer.

(a) Identify the government act that regulates the use of personal information.

Privacy Act (1988)

(b) Describe two aspects of this act that AussieToys needs to consider when collecting personal information about their customers.

Considerations could include:
- Need to have a clear privacy policy available
- Open and transparent management of personal information
- Use and/or disclosure of personal information
- Ensuring the security of personal information
- Customer access to personal information that is being stored
- Allowing customers to correct personal information

Programming

Pseudocode

Exercises

Bridget was surprised to learn that her school is still recording swim times at the annual swimming carnival with pen and paper. Having done all the programming practice activities for her Computer Science class, Bridget confidently offered to write a program to make the job easier. So far, she's made a good start but needs help finishing it!

Her program uses a record to store information about each swim. She then plans to store each record in an array so that she can easily calculate things such as the average swim time for each house and the year group champions.

Consider Bridget's partially completed algorithm below:

```
RECORD
        SwimData
                studentID: Integer
                yeargroup: Integer
                house: String
                time: Float


GLOBAL
        swims ← SwimData[]

MODULE Main
        CALL EnterSwimTimes()

        INPUT(house)
        OUTPUT(HouseAverage(house))

        INPUT(yeargroup)
        OUTPUT(YearGroupChamp(yeargroup))
END Main
```

Part 1
Write the module EnterSwimTimes() such that the user can enter all the relevant data for each swim, including the studentID, yeargroup and house of each swimmer as well as their time.
Your module should:
- Allow for an unknown number of swims be entered.
- Ensure that all times are greater than 0.
- Store all information about each swim in the global array **swims**.

```
MODULE EnterSwimTimes()
      REPEAT
                INPUT(studentID)
                INPUT(yeargroup)
                INPUT(house)
                REPEAT
                        INPUT(time)
                UNTIL time > 0
                newSwim ← SwimData
                newSwim.studentID ← studentID
                newSwim.yeargroup ← yeargroup
                newSwim.house ← house
                newSwim.time ← time
                swims.append(newSwim)
                INPUT(Continue)
      UNTIL Continue = "N"
END EnterSwimTimes
```

Part 2
Write the function *HouseAverage* that will return the average swim time across all swimmers in a given *house*.

```
FUNCTION HouseAverage(house)
      total ← 0
      count ← 0
      FOR i ← 0 TO swims.Length – 1 DO
              IF swims[i].house = house THEN
                      total ← total + swims[i].time
                      count ← count + 1
              END IF
      END FOR
      HouseAverage ← total / count
END HouseAverage
```

Part 3
Write the function *YearGroupChamp* that will return the *studentID* for the student with the fastest swim time in a given *yeargroup*.

```
FUNCTION YearGroupChamp(yeargroup)
        fastest ← -1
        YearGroupChamp ← 0
        FOR I ← 0 TO swims.Length – 1 DO
                IF swims[i].yeargroup = yeargroup THEN
                        IF swims[i].time < fastest OR fastest < 0 THEN
                                fastest ← swims[i].time
                                YearGroupChamp ← swims[i].studentID
                        END IF
                END IF
        END FOR
END YearGroupChamp
```

Desk Checking

Exercises

Question 1
Consider the following pseudocode:

```
1        MODULE Main
2                min ← 100
3                total ← 0
4                average ← 0
5                FOR i ← 1 TO 3 DO
6                        INPUT(num)
7                        total ← total + num
8                        IF min > num THEN
9                                min ← num
10                       END IF
11               END FOR
12               average ← total / 5
13       END Main
```

Complete a trace table for the algorithm using the following test data for the variable *num*:

<div align="center">5   3   7</div>

Line	Min	Total	Average	i	num	Min > num
2	100					
3		0				
4			0			
5				1		
6					5	
7		5				
8						TRUE
9	5					
5				2		
6					3	
7		8				
8						TRUE
9	3					
5				3		
6					7	
7		15				
8						FALSE
12			3			

Question 2

Refer to the following code snippet to answer the questions below.

```
BEGIN
        n ← "Jeff"
        found ← False

        FOR i ← 0 TO 4 DO
                IF names[i] = n THEN
                        found ← TRUE
                        OUTPUT("Found")
                END IF
        END FOR

        IF found = False THEN
                OUTPUT("Not found")
        END IF
END
```

Use the following test data to complete the trace table for the algorithm in the table below.

names ← ["Chris", "Ashley", "Graham", "Jeff", "Geoff"]

n	found	i	names[i] = n	Output	found = False
Jeff	False	0	False		
		1	False		
		2	False		
	True	3	True	Found	
		4	False		False

Structure Charts

Exercise

Consider the pseudocode below.

```
GLOBAL CONSTANT
        WEEK_HOURS ← 37.5

MODULE Main
        name ← ""
        base_rate ← 0
        hours ← 0

        INPUT(name)
        INPUT(base_rate)
        INPUT(hours)

        gross_pay ← CalculateGrossPay(base_rate, hours)
        tax ← CalculateTax(gross_pay)
        FinalisePayment (gross_pay, tax, name)
END Main

FUNCTION CalculateGrossPay(rate, hours)
        IF hours > WEEK_HOURS THEN
                overtime_pay ← CalculateOvertimePay(rate, hours – WEEK_HOURS)
                CalculateGrossPay ← WEEK_HOURS * hours + overtime_pay
        ELSE
                CalculateGrossPay ← hours * rate
        END IF
END CalculateGrossPay

FUNCTION CalculateTax(pay)
        total_tax ⭠ 0
        CASE pay OF
                pay <= 500:
                        total_tax ⭠ 0
                pay <= 1000:
                        total_tax ⭠ pay * 0.25
                pay > 1000:
                        b2 = (pay – 1000) * 0.35
                        b1 = 1000 * 0.25
                        total_tax ⭠ b1 + b2
        END CASE
        CalculateTax ⭠ total_tax
END CalculateTax

FUNCTION CalculateOvertimePay(base_rate, overtime_hours)
        CalculateOvertimePay ← 0
END CalculateOvertimePay
```
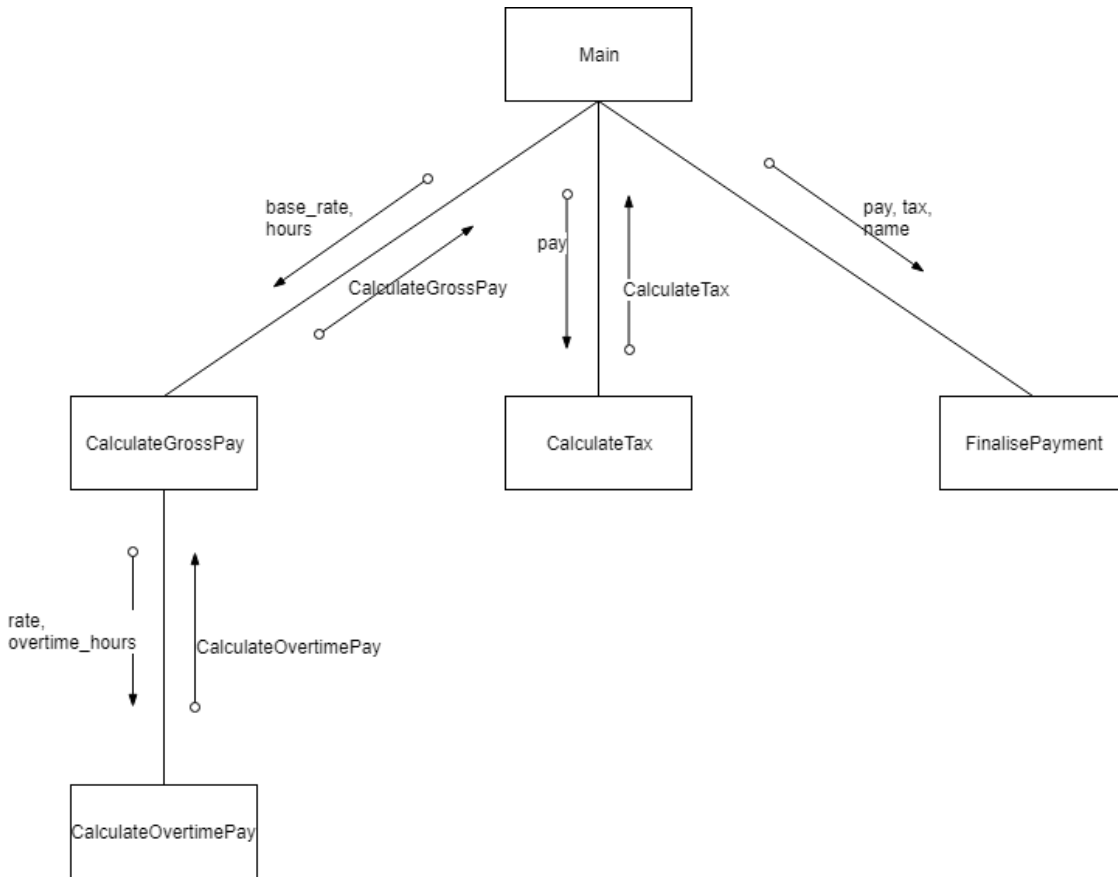
MODULE FinalisePayment (pay, tax, name)
        PRINT("Payment finalised")
END FinalisePayment

Create a structure chart to reflect the pseudocode.

Networks and Communication

Transmission Media

Exercises

Question 1

Jacob lives on a farm in regional WA and would like to get access to broadband Internet. There is currently an old copper phone line running to the property that he has been using for a dial-up Internet connection. In the distance he can see a local mountain with a telecommunications tower that can transmit both cellular and microwave signals.

With reference to the most appropriate transmission medium(s), explain how Jacob could get access to a high-speed broadband Internet connection throughout his house. Provide justification for your choices.

Complete explanation should include:
- Use of microwave to get broadband to house. Most suitable as have direct line of sight to communications towers.
- This will be faster and more reliable than satellite
- Cellular does not have the range to reach his property
- Cheaper and easier than getting optic fibre installed.
- Brief description of how network could be set up in house, for example:
  - In the house, connect a router to the microwave connection and then set up a wireless network using a WAP

TCP/IP Model

Exercises

Question 1

For each layer of the TCP/IP model, identify one protocol and use that to describe to purpose of that layer.

Layer	Protocol	Purpose
Application	HTTP HTTPS SMTP	HTTP allows the web browser to make a request to a webserver for a web page. This request then gets passed to the Transport Layer for further processing
Transport	TCP UDP	The Transport layer uses TCP to divide the message into packets and add information that will allow the message to be reassembled at the destination.
Internet	IP	IP is used by the Internet layer to allow the network to address packets and route them to the required destination on the network (using IP addresses)
Network	Ethernet 802.3 Ethernet 802.11	The network layer is responsible for placing TCP/IP packets on the network medium. Ethernet 802.11 (or 802.3) defines how packets should be placed on a wireless network. Ethernet 802.3 defines how packets should be placed on a wired network.

Question 2

Complete the table below with information about various devices used within a network. Describe the role of the device, which layer of the TCP/IP model it operates at and what type of addressing it uses.

Device	Role	TCP/IP Layer	Address Type
Switch	A switch connects multiple devices together and allows them to communicate and form a LAN	Network	MAC Address
Router	Directs data packets between networks using IP addresses and the information in its routing table.	Internet	IP Address
NIC	A Network Interface Card (NIC) allows a device to connect to a network using a specific transmission medium	Network	MAC Address
Firewall	A firewall creates a barrier between the internal, trusted network and another outside network, preventing unauthorised users accessing the network and its resources.	Transport (could also be Network depending on type of firewall)	Port

Question 3

TCP and IP are two important protocols that form the basis of most Internet communications.

(a) Explain the purpose of TCP.

TCP is responsible for breaking a message up into a number of smaller packets and numbering them so that they can be reassembled in the correct order by the receiving device. TCP is also responsible for detecting any errors in transmission and requesting packets to be resent if they are corrupted or do not arrive in a timely manner.

(b) Explain the purpose of IP.

IP is responsible for the addressing and delivery of packets of data across a network. IP controls how data is moved across and between networks, and directs the routing of packets across networks.

Network Security

Exercises

Question 1

Vikki is responsible for network security at a local hospital and has decided to implement new password and network user policies to help ensure the security of the network. Describe three policies that could be implemented to help keep the network secure.

Policies could include:
- Setting rules on what passwords are acceptable (e.g. length, use of special characters, mixed case)
- Mandating that passwords need to be changed regularly
- Restricting who has access to different parts of the network
- Restricting what software employees can install on computers
- Restricting what devices can be added to the network (e.g. no personal devices)

Question 2

Explain each of the following network vulnerabilities:

Denial of Service (DoS)

the purpose of a DoS attack is to prevent access to network resources by flooding the network with network requests (for example, sending a large number of requests for a page to a web server)

IP Spoofing

attackers hide their identity by modifying the source IP address to pretend that the communications have come from a trusted source.

Question 3

(a) Explain the term 'backdoor' as it applies to network security.

In network security, a backdoor is a method used to access a computer/network that bypasses the normal security measures on that network.

(b) Describe a situation where using a backdoor could be considered ethically sound.
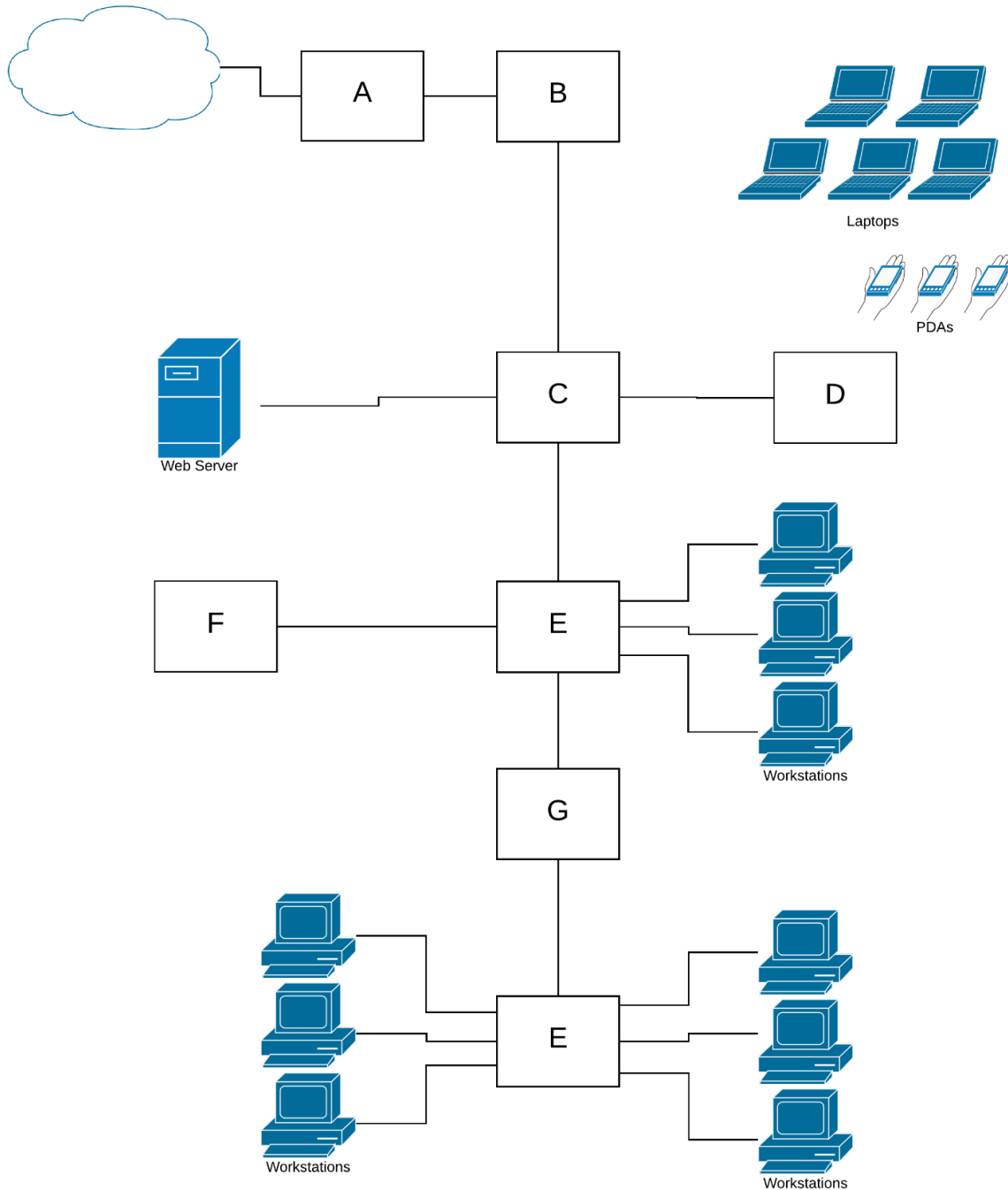
For example, a developer needs to access a program in order to perform maintenance/upgrades.

Network Diagrams

Exercises

Question 1

Whilst building their new system, Furclass have also decided to upgrade their network infrastructure. The following network diagram shows how their new network has been set up.

(a) In the table below, identify the network devices in the diagram that have been labelled A-G. Explain the purpose of each device in a network.

| Label	Device	Purpose
A	Modem	Converts signals from the network to a form that can travel over
B	Firewall	A firewall restricts access to a network to prevent unauthorised users accessing the network.
C	Router	A router forwards data packets between networks by determining the best path for the data packets to take
D	WAP	Allows devices to connect to the network using Wi-Fi.
E	Switch	Connects network devices together to form a network segment
F	NAS	Provides file-level storage to the network, allowing network users to access shared files and increased storage.
G	Bridge	Connects two network segments to create a single, larger network segment.

(b) After setting up the new network, the staff have found that all the workstations are able to connect to the Internet, however nobody can connect via their mobile devices when they are connected to the network. Identify which device (A, B, C, D, E, F or G) is likely to be experiencing problems and explain why you have come to this conclusion.

Device: D because the switch, router and modem must all be working as the workstations are all able to connect to the Internet – it is only the wireless devices that are having trouble connecting to the network.

Question 2

The warehouse has an office located at the front of the building where a receptionist can greet customers and coordinate the work from a desktop workstation. The database server is located in a locked storage room at the rear of the office, and there is a shared network printer in the corner. There is also a small office where the warehouse manager has a desktop workstation from where she can access the network. The entire network has access to the Internet through a shared connection to their ISP and is protected by a firewall.

Draw a network diagram to show how the various devices are connected, clearly labelling each device. Label any necessary transmission media, network communications standards and/or network control protocols that would be used with the various parts of the network.
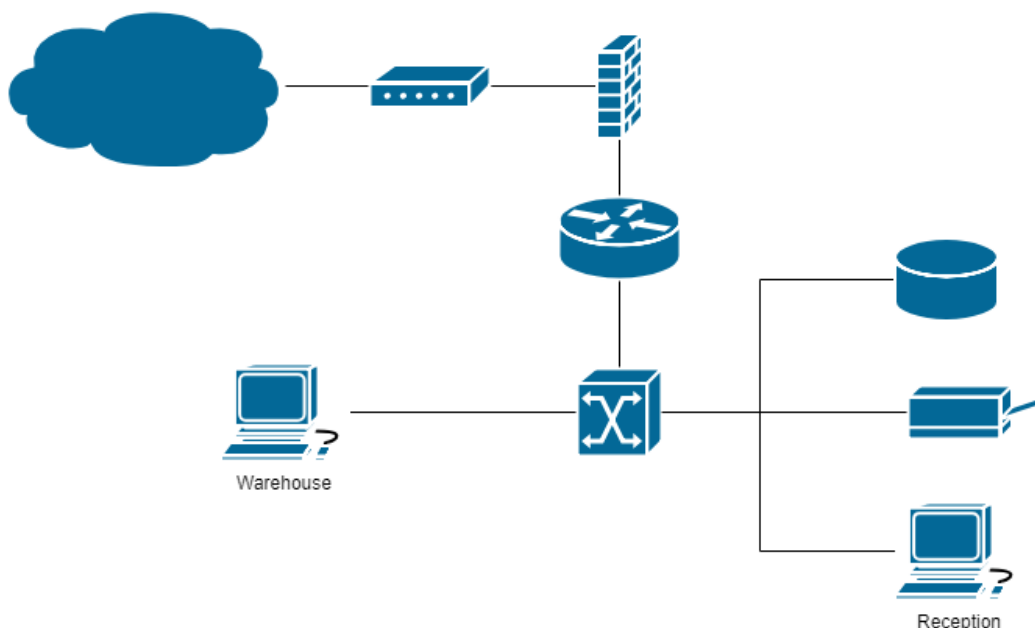
Question 3

Vikki is the network administrator at White Wilderness – an adventure company specialising in family tours to Antarctica. They have fitted a cruise ship out with a computer network to provide guests and crew with Internet access and computing facilities whilst away. The ship's network consists of the following:

- Six computers on the main deck floor forming their own LAN segment where guests can get Internet access and process their photos
- Several handheld devices that visitors can use on the vessel to access email and view video of the local wildlife
- Two computers in the reception desk for staff to process guests when they board the ship and keep track of any special guest requirements
- Three computers in the office area for the crew
- Three laptops that the ship's officers use to connect to the network wirelessly
- One printer that all crew connected to the network can use

NOTE: This solution does not use the correct symbols. To get full marks in an exam you would need to use the correct CISCO symbols.
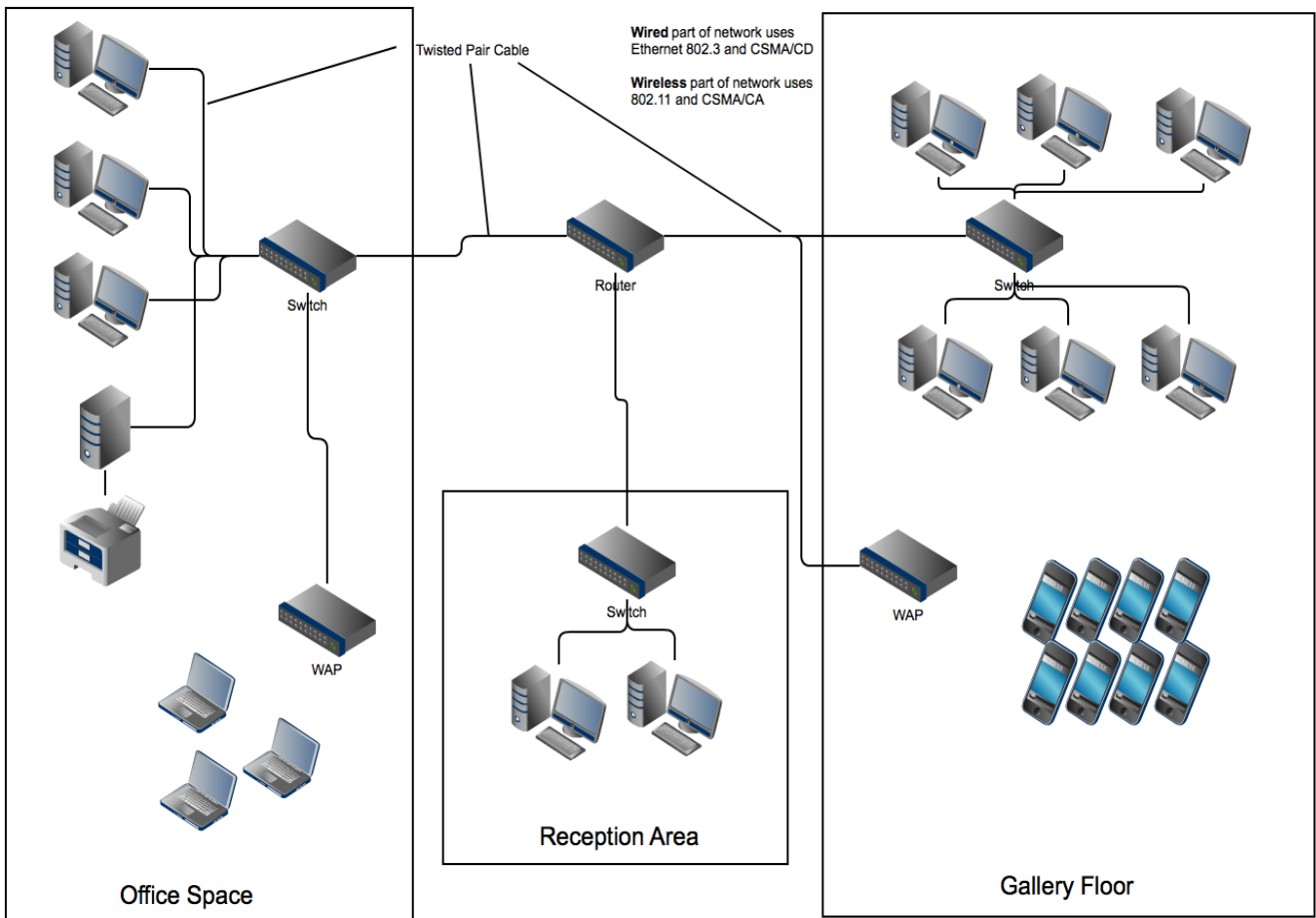
Congratulations! You have now completed your revision booklet!

Edith Cowan University would like to wish all students the best of luck with their future exams!