Government of **Western Australia**
School Curriculum and Standards Authority

COMPUTER SCIENCE

ATAR course examination 2022

Marking key

Marking keys are an explicit statement about what the examining panel expect of candidates when they respond to particular examination items. They help ensure a consistent interpretation of the criteria that guide the awarding of marks.

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Section One: Short answer **40% (113 marks)**

Question 1 **(2 marks)**

Outline the difference between an interpreter and a compiler.

Description	Marks
Outlines the difference between an interpreter and a compiler.	2
Identifies the difference between an interpreter and a compiler.	1
Total	**2**
Answers could include: A compiler needs to translate the source code into machine code to create an executable before it can run. An interpreter translates the source code at the time of execution one line at a time, it does not require the generation of machine code.	
Accept other relevant answers.	

Question 2 **(2 marks)**

Outline the role of a modem.

Description	Marks
Outlines the role of a modem.	2
Limited information about the role of a modem.	1
Total	**2**
Answers could include: A modem receives data from a computer hardware device and coverts it from a digital format to an analog format. Once received it converts the data from analog to digital. This is called modulation and demodulation.	
Accept other relevant answers.	

Question 3 **(3 marks)**

Explain a characteristic that a program's external documentation should contain to reduce user errors and enhance the user experience during operation.

Description	Marks
Explains a characteristic that a program's external documentation should contain to reduce user errors and enhance the user experience during operation.	3
Describes a characteristic that a program's external documentation should contain to reduce user errors and enhance the user experience during operation.	2
Limited information about a characteristic that a program's external documentation should contain to reduce user errors and enhance the user experience during operation.	1
Total	**3**
Answers could include. External documentation can include an user manual. The user manual could have screen shots of each process. Could have trouble shooting examples that are at an adequate level to help the user. Information could be easily found and links to examples on how to complete a task is helpful.	
Accept other relevant answers.	

Question 4 **(4 marks)**

Refer to the partial pseudocode below:

```
IF a>5 AND a<25
   Print a
ENDIF
```

(a) Describe, with an example, the test data you would use to check this algorithm for accuracy. (3 marks)

Description	Marks
Describes the test data using an example as to how they would use to check the algorithm for accuracy.	3
States the test data using an example as to how they would use to check the algorithm for accuracy.	2
Limited information of the test data they would use to check the algorithm for accuracy. May provide an example.	1
Total	**3**
Answers could include: Test data should be used on either side of the statement as well as in the middle. Need a number below 5, greater than 25 and in the range. To have further accuracy also use the numbers 5 and 25.	
Accept other relevant answers.	

(b) Identify the stage of the software development cycle (SDC) at which algorithms are tested. (1 mark)

Description	Marks
Correctly identifies the stage of the SDC this activity is likely to take place.	1
Total	**1**
Stage: Debug syntax and logic errors or Test to meet specifications	
Accept other relevant answers.	

Question 5 **(4 marks)**

Explain a difference between the dynamic host configuration protocol (DHCP) and domain name server (DNS).

Description	Marks
Explains a difference between the dynamic host configuration protocol (DHCP) and domain name server (DNS).	4
Describes a difference between the dynamic host configuration protocol (DHCP) and domain name server (DNS).	3
Provides a statement about dynamic host configuration protocol (DHCP) and domain name server (DNS).	2
Limited information about dynamic host configuration protocol (DHCP) or domain name server (DNS).	1
Total	**4**
Answers could include DNS is an internet service that translates domain names into IP addresses while DHCP is a protocol that assigns the IP address to the host in a network dynamically through a set range of IP addresses. While a DHCP server sends out information that clients need to communicate with other machines and services, DNS ensures that servers, clients, and services can be found by their names.	
Accept other relevant answers.	

Question 6 **(10 marks)**

Outline the role of the following hardware devices in network communications.

Description	Marks
For each device (5 x 2 marks)	
Outlines the role of the hardware device in network communications.	2
Limited information of the role of the hardware device in network communications is provided.	1
Total	**10**

Answers could include:

Router:
A router connects two or more networks or subnetworks. It will read a packet's header to determine its destination (IP address), then refers to a routing table to determine most efficient route before forwarding the packet to its IP address.

Wireless access point:
Is a wired network device that emits signals for wireless devices to connect and access the network.

Gateway:
This is a network point that allows access to another network that uses different protocols. It acts as a 'gate' between the two networks.

Switch:
Connects multiple wired devices within a network together. A switch receives and forwards network packets from one device to another on a network.

Firewall:
A network security device that monitors traffic and either allows or blocks data packets based on a set of rules. Can help protect network by filtering traffic and blocking outsiders from gaining unauthorized access to the private data on your computer.

Accept other relevant answers.

Question 7 **(8 marks)**

Write a pseudocode example for each of the following control structures and scenarios.

Description	Marks
Sequence: Pseudocode examples.	
Accurate example of sequence control structure to address scenario	2
Limited example of sequence control structure to address scenario	1
Subtotal	**2**
Selection: Ticket prices differ according to age – 16 years and over pay $35, 15–5 years pay $20 and under 5 years pay $10, Output the price	
Accurate nested IF or Case statement used with all conditions	2
Incorrect use of IF or Case statement with some conditions missing	1
Output	
Output statement is accurate and in the correct placement	1
Subtotal	**3**
Iteration: Total an unknown number of scores and output the total	
Accurate iteration (either test first or last) used with the correct inputs and calculations	2
Incorrect use of iteration and/or some inputs calculations missing	1
Output	
Output statement is accurate and in the correct placement	1
Subtotal	**3**
Total	**8**

Answers could include:

Sequence

```
INPUT (Num1)
INPUT (Num2)
answer ← (Num1 + Num2) x 6
OUTPUT (answer)
```

Selection

Two-way

```
INPUT (age)
IF (age >= 16)  THEN
   Price ← 35
ELSE
    IF (age < 5) THEN
        Price ← 10
    ELSE
        Price ← 20
    END IF
END IF
OUTPUT ('$', Price)
```

Iteration (any one of the examples below)

Test-last loop

```
total ← 0
REPEAT
INPUT (score)
   total ← total + score
   INPUT (continue)
UNTIL continue = 'N'
OUTPUT (total)
```

Test-first loop

```
total ← 0
continue ← 'Y'
WHILE continue = 'Y'
    INPUT (score)
    total ← total + score
    INPUT (continue)
END WHILE
OUTPUT (total)
```

Accept other relevant answers.

Question 8 **(6 marks)**

Review the partial pseudocode below.

```
Begin
trees←0
sales←0
bonus ←15
        For employee ← 1 to 8 do
            input(sales)
            trees = trees + sales + bonus
        EndFor
End
```

(a) Identify a constant and a variable in the pseudocode. (2 marks)

Description	Marks
Correctly identifies bonus as a constant.	1
Correctly identifies either trees, sales or employee as a variable.	1
Total	**2**

(b) Describe why it is important to have appropriate naming conventions for variables. (2 marks)

Description	Marks
Describes why it is important to have appropriate naming conventions.	2
Outlines why it is important to have appropriate naming conventions	1
Total	**2**
Answers could include: A variable name should reflect the value that it is holding. The name should reveal the intent with which it is to be used so that it is easily understood by the programmer and easier to change the code should it need it. Poorly named variables may make the program ambiguous.	
Accept other relevant answers.	

(c) Outline a difference between a one-dimensional array and a record. (2 marks)

Description	Marks
Outlines a difference between a one-dimensional array and a record.	2
States a difference between a one-dimensional array and a record.	1
Total	**2**
Answers could include: An array can be used to store a list of values of the same data type. A record can store data of multiple data types in fields.	
Accept other relevant answers.	

Question 9 **(9 marks)**

A company keeps all employee timesheets in a single table database. Use your knowledge of databases to answer the questions below:

(a) Describe, with an example from the single table database above, the concept of an update anomaly. (3 marks)

Description	Marks
Example	
Example of update anomaly from the data.	1
Subtotal	**1**
Description	
Describes the concept of an update anomaly.	2
States the concept of an update anomaly.	1
Subtotal	**2**
Total	**3**
Answers could include: An update anomaly occurs when multiple instances of data appear with different errors or when one record is updated others may be missed that causes data redundancy. An example from the data that has occurred is that Max in line 2 should be Maxine. Another example includes if Tran Nguyen's hourly rate changes it would need to be replicated through three different records.	
Accept other relevant answers.	

(b) Describe, with an example from the single table database above, the concept of delete anomaly. (3 marks)

Description	Marks
Example	
Example of delete anomaly from the data	1
Subtotal	**1**
Description	
Describes the concept of a delete anomaly.	2
States the concept of a delete anomaly.	1
Subtotal	**2**
Total	**3**
Answers could include: A delete anomaly occurs when deletion of a record results in data that is unavoidably lost because the data does not appear anywhere else. An example would be if Tran Nguyen leaves the company then three records associated with him would be delete including his net pay.	
Accept other relevant answers.	

(c) Using an example from the single table database on page 8, describe the normalisation process that you would undertake to remove data redundancy. (3 marks)

Description	Marks
Example	
Example from the data of the normalisation process to remove data redundancy.	1
Subtotal	**1**
Description	
Detailed description of the normalisation process to remove data redundancy.	2
Limited description of the normalisation process to remove data redundancy.	1
Subtotal	**2**
Total	**3**

Answers could include:

- Assigned a primary key (PK) and remove any repeating groups of data.
- Ensure that all non-key attributes are fully functionally dependant on the primary key
- Remove any transitive functional dependencies

An example would be to create three tables – employee, tax, work
In Employee – employeefirst, employeesurname and DOB and EmployeeID as PK
In Tax – Gross pay, Tax, Netpay and taxfilenumber as a PK
In Work – Week, hours, overtime and have EmployeeID and taxfilenumber as the primary keys.

Accept other relevant answers.

Question 10 **(5 marks)**

Benchmarking is used widely within organisations.

(a) Outline the purpose of benchmarking to determine system performance. (2 marks)

Description	Marks
Outlines the purpose of using benchmarking to determine system performance.	2
States the purpose of using benchmarking to determine system performance.	1
Total	**2**
Answers could include: Benchmarking is a tool for assessing and comparing performance in order to achieve continuous improvement. It can address a number of aspects including hardware and software benchmarking.	
Accept other relevant answers.	

(b) Outline with an example how hardware benchmarking is used. (3 marks)

Description	Marks
Example	
Example of hardware benchmarking.	1
Subtotal	**1**
Benchmarking	
Outlines how hardware benchmarking is used.	2
States how hardware benchmarking is used.	1
Subtotal	**2**
Total	**3**
Answers could include: Hardware benchmarking is used to test the performance and suitability to meet system requirements. For example, a new CAD package may require specific CPU and graphics card.	
Accept other relevant answers.	

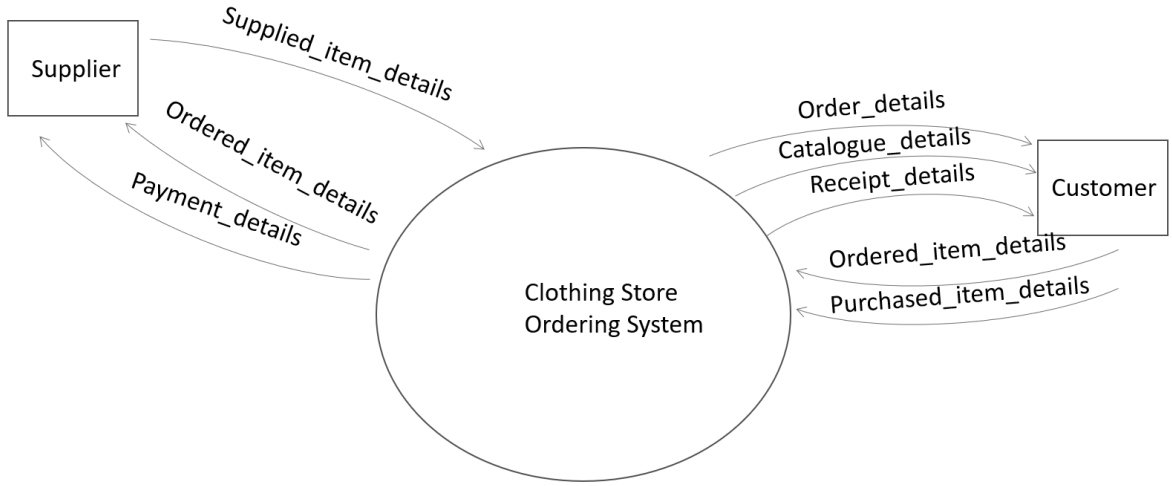
Question 11 **(7 marks)**

Create a context diagram for the following ordering system.

A clothing store informs customers when a new catalogue arrives. Customers visit the clothing store to view a selection of the items to purchase. If an item is not available in the store, the customer can order the item. The store orders the item from the supplier. The supplier dispatches the item. The customer is then notified when the item has arrived in the store. The customer visits the store, tries on the item and, if satisfied, purchases the item and receives a receipt. The store then pays the supplier for the item.

Description	Marks
Naming of system	1
Two entities – Supplier and Customer	1–2
Data flows in and out from system to Supplier	1–2
Data flows in and out from system to Customer	1–2
Total	**7**

Example answer:



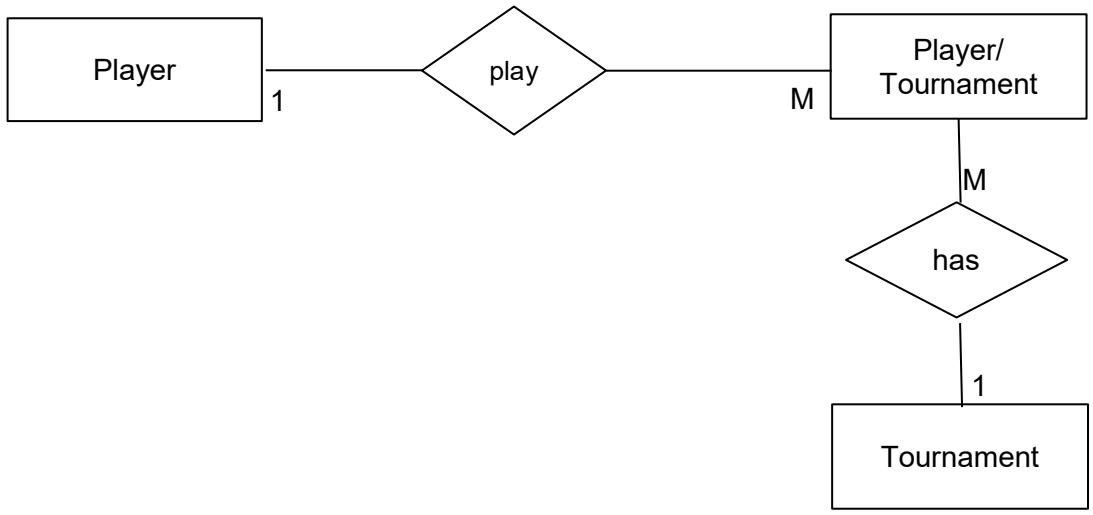
Accept other relevant answers.

Question 12 **(3 marks)**

Resolve the many to many (M:N) relationship and draw an updated diagram to reflect the change.

Description	Marks
The inclusion of an appropriate associative entity.	1
The inclusion of correct cardinality of 1:M with the associative entity from entities player and tournament.	1–2
Total	**3**

Answers could include:



Accept other relevant answers.

Question 13 **(4 marks)**

Outline an activity that will be used in each of the following stages of the systems development life cycle (SDLC).

Description	Marks
For each activity (2 x 2 marks)	
Outlines an activity that will be used in the stage of the SDLC.	2
Identifies an activity used in the stage of the SDLC.	1
Total	**4**

Answers could include:

Analysis:
Finding out how the system is currently working through different methods of data gathering such as work shadowing, questionnaires, etc.

Development:
This is when the system is being developed – coding of software, ordering of devices and infrastructure, etc.

Accept other relevant answers.

Question 14 **(5 marks)**

(a) Describe the purpose of a standard operating environment (SOE). (3 marks)

Description	Marks
Describes the purpose of a standard operating environment (SOE).	3
Outlines the purpose of a standard operating environment (SOE).	2
States a fact about a standard operating environment (SOE).	1
Total	**3**
Answers could include: The purpose of an SOE is to ensure large numbers of computer systems are provided with the necessary functionality and maintenance required. This is facilitated through standardising computer systems within an environment to allow for automated deployment of software and services, to ensure security, and adequate support.	
Accept other relevant answers.	

(b) State **one** advantage of a SOE. (1 mark)

Description	Marks
States an advantage of a SOE.	1
Total	**1**
Answers may include any one of the following: • reduce time it takes to install, update software through imaging processes • centrally manage software and maintenance • essential upgrades and fixes can be tested on a small number before rolling out, reducing errors and cutting downtime • purchase software licences and hardware in bulk, reducing costs.	
Accept other relevant answers.	

(c) State **one** disadvantage of a SOE. (1 mark)

Description	Marks
States a disadvantage of a SOE.	1
Total	**1**
Answer could include any one of the following: • specialist software required by some staff may not be available through an SOE • some staff may need to learn new software or adjust to a new operating system.	
Accept other relevant answers.	

Question 15 **(4 marks)**

Outline the role of the operating system in the following tasks.

Description	Marks
For each of managing concurrency and managing devices (2 x 2 marks)	
Outlines the role of the operating system in the task.	2
States the role of the operating system in the task.	1
Total	**4**

Answers could include:

Managing concurrency:
Concurrency is the processing and execution of several instructions at the same time on multiple processes on a single system or distributed system. This occurs within an operating system when multiple process threads are executing 'concurrently' (at the same time).

Managing devices:
An operating system manages devices by communicating with the device driver. The OS tracks all devices on the system (through the I/O controller), decides on which process will utilise the device and the duration of the use of the device, allocates the device to the process in an efficient way.

Accept other relevant answers.

Question 16 **(4 marks)**

Using information from the diagram above, explain the steps involved in the 'fetch' stage of the fetch-execute cycle prior to the instruction being decoded by the control unit.

Description	Marks
Explains using information from the diagram, each of the steps required to 'fetch' an instruction for processing.	4
Describes using information from the diagram, most of the steps required to 'fetch' an instruction for processing.	3
Outlines the steps required to 'fetch' an instruction for processing.	2
Identifies some of processes required to 'fetch' an instruction for processing.	1
Total	**4**

Answers could include:

1. Program Counter (PC) holds the address of the next instruction "100"
2. Address '100' from the program counter is sent via an internal Address Bus to the Memory Address Register
3. A signal is sent through the Address Bus to RAM, the Control Unit (CU) sends a read signal and the instruction "Load 96" of address "100" are copied through the data bus to the Memory Data Register.
4. The instruction "Load 96" is then copied into the Instruction Register via a Data Bus.
5. The Program Counter is incremented by 1 to "101".

Accept other relevant answers.

Question 17 **(2 marks)**

Describe an environmental issue related to the disposal of computer components.

Description	Marks
Describes an environmental issue related to the disposal of computer components.	2
States an environmental issue related to the disposal of computer components.	1
Total	**2**

Answer could include:

Many components that go into computer systems are toxic and dangerous to the environment if released or disposed of inappropriately.

Heavy metals are used in batteries and circuits and these can pollute ground water or kill animals if left exposed on landfill. Large quantities of plastics are used in systems, which take a long time to break-down, some of the plastic will eventually break down into toxins as it degrades.

Accept other relevant answers.

Question 18 **(4 marks)**

Compare data storage and data distribution methods for data warehouses and data marts.

Description	Marks
Distribution methods for data warehouses	
Compares data storage and data distribution methods for data warehouses.	2
Identifies data storage or data distribution methods for data warehouses.	1
Subtotal	**2**
Distribution methods for data marts	
Compares data storage and data distribution methods for data marts.	2
Identifies data storage or data distribution methods for data marts.	1
Subtotal	**2**
Total	**4**

Answer could include:

A data warehouse is a database that contains all of the data for an enterprise. It is used for analytics and creating data reports and sets from multiple sources. A data warehouse is large and centralised and contains data from many sources within an enterprise.

A data mart is a sub-set of data from the data warehouse. The data mart is dedicated to a specific department of function. It contains only essential business information making it quick and easy to access. A data mart is normally stored in one place this maybe in the cloud or in a centralised place within the department.

Accept other relevant answers.

Question 19 **(4 marks)**

A company wishes to introduce a new business management software that all employees will need to use. Currently it has 20 employees, but this will be expanded by the end of the year to over 50.

Identify an appropriate software licence for it to purchase and explain why this type of licence would be most suitable for this business.

Description	Marks
Identifies the appropriate software licence.	1
Subtotal	**1**
Explains why this type would be most suitable.	3
Describes why this type would be most suitable.	2
States why this type would be most suitable.	1
Subtotal	**3**
Total	**4**
Answers could include: Enterprise Licence: This type of software licence is a contract that is issued to large organisations usually for a fixed amount of time. It allows unlimited use of the program throughout the organisation. It is not necessary to register the software each time it is installed on a computer. This is suitable for this business as all employees will be able to access the software without any restrictions, and it will allow for the expansion of the business without having to add in additional licences.	
Accept other relevant answers.	

Question 20 **(3 marks)**

A workshop has a lot of heavy machinery operating throughout the day, and requires a cable to connect a workstation to a switch.

Which of the following, unshielded twisted pair (UTP) or shielded twisted pair (STP) cable, would be the more suitable? Justify your response.

Description	Marks
Explains why the cable would be the most suitable.	3
Describes why the cable would be the most suitable.	2
States why the cable would be the most suitable.	1
Total	**3**
Answers could include: Shielded twisted pair cable: Twisted pair cable is made up of four pairs of twisted copper wires, a shielded twisted pair cable applies a shield to each one of the pairs on a cable or to all of the pairs together. This shield can reduce EMI (electromagnetic interference), which would be emitted from the heavy machinery. This increased data transmission quality in the workshop. STP can also reduce crosstalk.	
Accept other relevant answers.	

Question 21 **(7 marks)**

(a) Write a query using SQL that will list all of the Supplier contact names in the city of Perth or Fremantle. (3 marks)

Description	Marks
SELECT Suppliers.SupplierName	1
FROM Suppliers	1
WHERE Suppliers. Suburb = “Perth” OR Suppliers.Suburb = “Fremantle”	1
Total	**3**
Answers could include: SELECT Suppliers.SupplierName FROM Suppliers WHERE Suppliers.Suburb = “Perth” OR Suppliers.Suburb = “Fremantle”	
Accept other relevant answers.	

(b) Write a query using SQL that will update the ContactNumber for Steve Sales from Rafiki Building Supplies to 0410011001. Note: both tables must be used in this query. (4 marks)

Description	Marks
UPDATE Manager INNER JOIN Suppliers ON Suppliers.SupplierID = Manager.SupplierID	1
SET Manager.ContactNumber = ‘0410011001’	1
WHERE Suppliers.SupplierName = "Rafiki Building Supplies”	1
AND Manager.FirstName = “Steve" AND Manager.Surname = “Sales”	1
Total	**4**
Answers could include: UPDATE Manager INNER JOIN Suppliers ON Suppliers.SupplierID = Manager.SupplierID SET Manager.ContactNumber = '0410011001' WHERE Suppliers.SupplierName = "Rafiki Building Supplies" AND Manager.FirstName = "Steve" AND Manager.Surname = “Sales"	
Accept other relevant answers.	

Question 22 **(4 marks)**

The Acme company stores data for a private scientific research group. It has recently upgraded its storage capacity and needs to dispose of its existing hard drives securely.

Outline **two** methods for the secure disposal of the hard drives.

Description	Marks
For each of two methods (2 x 2 marks)	
Outline the method for the secure disposal of the hard drives.	2
Identifies the method for the secure disposal of the hard drives.	1
Total	**4**

Answers could include:

Acme company need to ensure that if they are reselling the drives that they wipe the drive (this should be done regardless of destruction of drive) to the DoD standard.

- Disassemble drive by pulling apart the drive the data would not be accessed
- Destroy the metal disk either by drilling holes so it cannot be read
- Encrypt drives with passwords that are not accessible
- Degaussing the hard drives
- Use specialised overwriting software

This would ensure that any software cannot be used to locate files.

Accept other relevant answers.

Question 23 **(4 marks)**

Sarah uses a range of computing devices to complete her studies, including a desktop computer at home, a laptop at school and her mobile phone.

Outline **two** advantages of cloud computing for Sarah.

Description	Marks
For each of two advantages (2 x 2 marks)	
Outlines the advantage of cloud computing for Sarah.	2
Identifies the advantage of cloud computing for Sarah.	1
Total	**4**

Answers could include:

- Sarah could keep all of her files in the cloud and easily access these with her devices. This way she does not have to keep different version on her desktop and laptop.
- Flexibility she could access the files from other devices such as the library etc.
- Disaster recovery if she accidently dropped or damaged a device – all files would be easy to access.

Accept other relevant answers.

Question 24 **(5 marks)**

(a) Outline a factor that can influence the performance of a network. (2 marks)

Description	Marks
Outlines a factor that can influence the performance of a network.	2
Identifies a factor that can influence the performance of a network.	1
Total	**2**
Answers could include: • The different factors that can influence the performance of a network include: bandwidth, network design, data collisions and excess broadcast traffic. • The bandwidth can influence through the method of transmission and medium used.	
Accept other relevant answers.	

(b) Describe how denial of service strategy works to compromise the security of networks. (3 marks)

Description	Marks
Describes how denial of service strategy compromises the security of networks.	3
Outlines how denial of service strategy works compromises the security of networks.	2
Limited information about how denial of service strategy works.	1
Total	**3**
Answers could include: A denial of service strategy usually works flooding the target host or network with traffic until the target can't respond or crashes. The targeted systems operations are affected when users are unable to access information systems and or network services.	
Accept other relevant answers.	

Section Two: Extended answer **60% (154 Marks)**

Question 25 **(41 marks)**

(a) Outline why a rapid application development (RAD) methodology would best suit this online ordering system. (2 marks)

Description	Marks
Outlines why a RAD methodology would best suit this system.	2
States why a RAD methodology would best suit this system.	1
Total	**2**

Answers could include:

A RAD can decrease the time required to design and develop the online ordering system allowing the system to be implemented in a timely fashion. This method relies on user involvement, prototyping and CASE tools and an iterative approach for a quick result. The project can remain open-ended as the grocery store owner can make feedback throughout development, ensuring satisfaction.

Accept other relevant answers.

(b) It was suggested by the chief designer that a pilot implementation should occur over the first three months.

(i) Outline why a pilot implementation would be suggested. (2 marks)

Description	Marks
Outlines why a pilot implementation should occur.	2
States why a pilot implementation should occur.	1
Total	**2**

Answers could include:

Pilot implementation involves introducing the new system to a few or a section of the users and then rolling it out to all customers after the three months. The old system would still be in operation should there be problems with the new system. The three months allows the project team to get feedback from the users and fix or improve problems. This would have been suggested to ensure that they do not lose customers through a poor ordering system.

Accept other relevant answers.

(ii) Describe **one** advantage and **one** disadvantage of using a pilot implementation for this project. (4 marks)

Description	Marks
Advantage	
Describes the advantage regarding the use of a pilot.	2
States an advantage regarding the use of a pilot.	1
Subtotal	**2**
Disadvantage	
Describes disadvantage regarding the use of a pilot.	2
States a disadvantage regarding the use of a pilot.	1
Subtotal	**2**
Total	**4**

Answers could include:

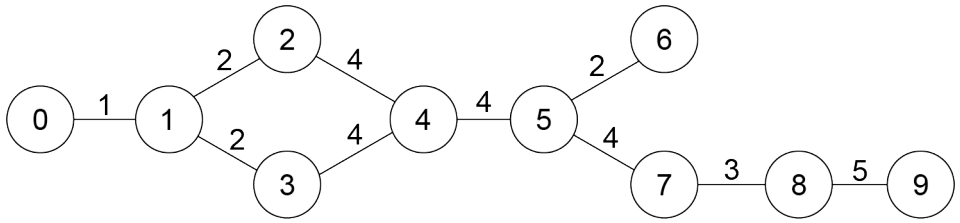
Advantages:
- new system is tried out with a small group of users or on one platform, allowing for feedback and any changes to be made before making it available to all customers on all platforms
- the old system will still run parallel to the pilot, therefore allowing the pilot group to revert to the old system should anything go wrong
- more cost effective than parallel
- less risky than a direct change-over, if the system has flaws it will only affect a small set of customers
- gives some customers/users time to learn how the software works allowing the grocery store time to develop accurate instructions for all other customers
- training for employees who need to take the orders can be done gradually.

Disadvantages:
- it will take longer to implement the new system for all customers or for different platforms
- customers using the new platform may become frustrated with the new system if it does not work as expected – may lose customers.

Accept other relevant answers.

Question 25 (continued)

(c) Create a PERT chart below from the information in the Gantt chart. (6 marks)

Description	Marks
PERT chart includes:	
Sequence 0-1	1
Branch 1-2-3	1
Sequence 3-4-5	1
Branch 5-6-7	1
Sequence 7-8-9	1
All durations correct	1
Total	**6**
	
Accept other relevant answers.	

(d) Describe the difference between a Gantt chart and a PERT chart. (3 marks)

Description	Marks
Describes the difference between a Gantt chart and a PERT chart.	3
Outlines the difference between a Gantt chart and a PERT chart.	2
Limited information about the difference between a Gantt chart and a PERT chart is provided.	1
Total	**3**
Answers could include: Gantt chart: graphical representation (bar graph) of the project broken down in to independent tasks. Each task is assigned a start and end date, each line in the graph represents the duration of each of the tasks. PERT chart: a network representation (nodes and vectors) of interdependent tasks within a project.	
Accept other relevant answers.	

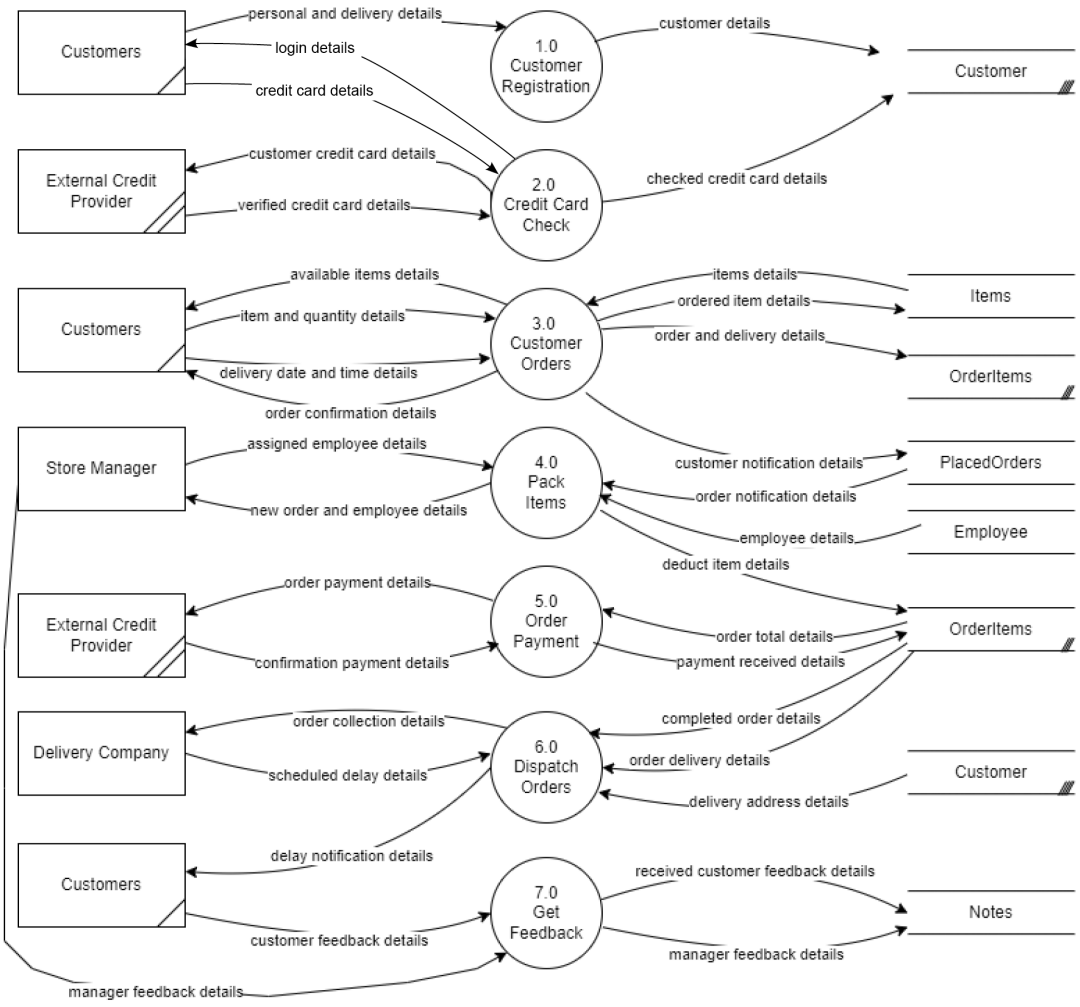
(e) Draw a Level 0 data flow diagram (DFD) to model the online grocery store requirements as described on page 2 of the Source booklet. (24 marks)

Description	Marks
Draws a Level 0 data flow diagram that features:	
External entities	
• Customers • External Credit Provider • Store Manager • Delivery Company	1–4
Subtotal	**4**
Data stores (named appropriately)	
• Customers • Items • OrderItems • PlacedOrders • Notes • Employee	1–6
Subtotal	**6**
Processes (must include number and verb)	
1.0 Customer registration 2.0 Credit card check 3.0 Process customer orders 4.0 Pack items 5.0 Process order payment 6.0 Dispatch orders 7.0 Get feedback	1–7
Subtotal	**7**
Appropriate data flows (drawn in correct direction and labelled appropriately)	
1.0 Customer registration	
Appropriate data flow/s in: personal and delivery details Appropriate data flow/s out: customer details	1
2.0 Credit card check	
Appropriate data flow/s in: card details, verified credit card details Appropriate data flow/s out: customer credit card details, checked credit card details, login details	1
3.0 Process customer orders	
Appropriate data flow/s in: items details, delivery date and time details, item and quality details Appropriate data flow/s out: available items details, order confirmation details, ordered item details, order and delivery details, customer notification details	1
4.0 Pack items	
Appropriate data flow/s in: assigned employee details, order notification details, employee details Appropriate data flow/s out: new order and employee details, deduct item details	1
5.0 Process order payment	
Appropriate data flow/s in: order total details, confirmation payment details Appropriate data flow/s out: order payment details, payment received details	1
6.0 Dispatch orders	
Appropriate data flow/s in: completed order details, order delivery details, delivery address details, scheduled delays details Appropriate data flow/s out: order collection details, delay notification details	1

Question 25 (continued)

7.0 Get feedback	
Appropriate data flow/s in: customer feedback details, manager feedback details Appropriate data flow/s out: received customer feedback details, received manager feedback details	1
Subtotal	**7**
Total	**24**

Answers could include:



Accept other relevant answers.

Answers can use fewer or more processes, as long as logic is clear and works. The data flow diagram is just one example of a DFD that could be drawn for the Online Grocery app.

Question 26 **(52 marks)**

(a) Outline **one** legal **or** ethical responsibility for customers using the online ordering system. (2 marks)

Description	Marks
Outlines one legal or ethical responsibility of customers when using the online ordering system.	2
Identifies one legal or ethical responsibility customers when the using online ordering system.	1
Total	**2**

Answers could include:

- must be 18 years of age or over
- make sure information is true and complete when completing the form
- do not use other customer's login details or other people's identity/payment details when ordering online
- do not disclose passwords to reduce fraudulent orders
- do not engage in dishonest practices whilst ordering online
- do not send feedback that is not true.

Accept other relevant answers.

(b) The online ordering application requires its customers to be at least 18 years of age. (5 marks)

Write the function CHECKAGE in pseudocode that:
- asks customers to input their date of birth (day, month and year)
- calculates their age based on the current day, month and year parameters
- returns the Age to the main module.

Description	Marks
Function name and parameters	1
Input DOB date, month and year	1
If Statement condition for Month AND Day	1
If Statement condition for Month	1
Age calculation	1
Total	**5**

Answers could include:

```
Function CHECKAGE (CurrentDay, CurrentMonth, CurrentYear)

    INPUT (DOBDay, DOBMonth, DOBYear)
    IF DOBMonth = CurrentMonth AND DOBDay<=CurrentDay THEN
        CHECKAGE = CurrentYear-DOBYear
    ELSE
        IF DOBMonth<CurrentMonth THEN
            CHECKAGE = CurrentYear-DOBYear
        ELSE
            CHECKAGE = (CurrentYear – 1) – DOBYear
        ENDIF
    ENDIF
End CHECKAGE
```

Accept other relevant answers.

Question 26 (continued)

(c) As part of the application for the online ordering system, a login module is required for customers.

Write the module CHECKLOGIN in pseudocode to allow a customer to have **three** attempts to log in. If they fail to log in correctly after the third time, they are locked out. After each attempt, they receive a message stating they only have so many attempts left. Once locked out, they are informed they need to email the IT Administrator at itadmin@onlinesystem.com.au. If password is correct print 'Welcome to the online grocery store'. (9 marks)

Description	Marks
Module end	1
Input of password before loop	1
Loop correctly formatted	1
Attempts initialised	1
Print statements in correct placement	1–3
If statements correctly formatted	1–2
Total	**9**

Answers could include:

```
Module CHECKLOGIN ()
    CorrectPassword= "CorrectPassword"
    Attempts ← 3
    Input (password)
    If password <> CorrectPassword then
        While Attempts >0 and password <> CorrectPassword do
        Attempts ← Attempts -1
        Print "you only have Attempts tries left"
        Input (password)
        If Attempts = 0 then
            Print "No more attempts Email the IT Administrator at
            itadmin@onlinesystem.com.au"
        EndWhile
    Else
        Print "Welcome to the online Grocery store"
    EndIf
End CHECKLOGIN
```

Accept other relevant answers.

(d) Using Chen's notation, draw an entity relationship (ER) diagram that represents the database for the online grocery store. (27 marks)

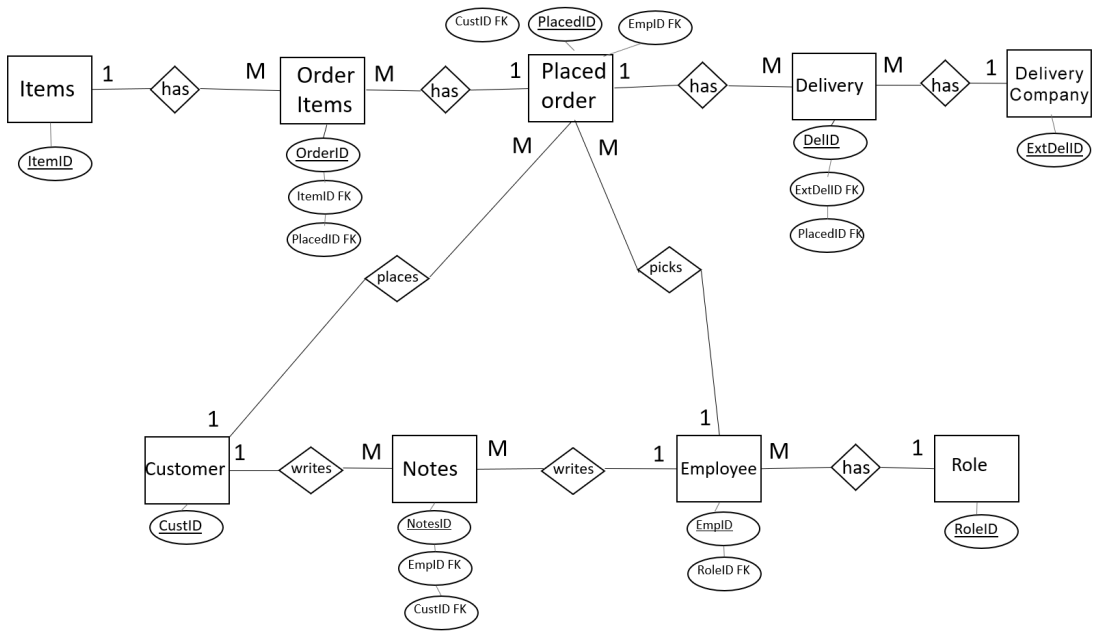
Your diagram will need to resolve all many to many relationships.

Note:
- one customer can place many orders
- many orders can have many items
- a customer can create many notes
- equally, an employee can create many notes
- many external delivery companies deliver many orders
- one role can have many employees
- one employee can pick many orders.

Include the following:
- entities
- names of all primary keys
- names of all foreign keys
- relationships
- cardinality

Description	Marks
1 mark for each correct entity and primary key	1–9
1 mark for each foreign key of the associate entities	1–9
1 mark for each relationship/cardinality between entities	1–9
Total	**27**

Answer could include:



Accept other relevant answers.

Question 26 (continued)

(e) Outline **two** potential security risks that could occur if this mistake is not corrected.
(4 marks)

Description	Marks
For each of the risks (2 x 2 marks)	
Outlines the potential security risk that could occur.	2
Identifies a potential security risk that could occur.	1
Total	**4**
Answers could include: • customer data is compromised and information such as credit cards could be uncovered • employee data such as payroll etc. could be uncovered and used for illegal purposes • customers may be the recipients of phishing masquerading as the store/business to steal details • malware may infect the system with spyware, trojans, viruses and ransomware.	
Accept other relevant answers.	

(f) The data entry forms for the customers and items tables have been provided in the Source booklet.

(i) Create **one** validation technique to help reduce errors for each form. (1 mark)
Customer data entry form

Description	Marks
Creates a correct validation technique to help reduce errors.	1
Total	**1**
Answers could include: Credit card number needs to accept the 16 numbers only Field size Customer_CC = 16	
Accept other relevant answers.	

(ii) Create **one** validation technique to help reduce errors for each form. (1 mark)
Items data entry form

Description	Marks
Creates a correct validation technique to help reduce errors.	1
Total	**1**
Answers could include: Item_price cannot be a negative number or 0 Item_price <>0	
Accept other relevant answers.	

(iii) Describe how validation techniques help reduce errors. (3 marks)

Description	Marks
Describes how validation techniques help reduce errors.	3
Outlines how validation techniques help reduce errors.	2
Limited information as to how validation techniques help reduce errors is provided.	1
Total	**3**
Answers could include: A credit card number only has 16 digits. It can ensure that customers put in the full 16 digits at the beginning instead of trying to secure payment with the incorrect card number. An item cannot have a price of 0 or less. This will ensure that when the items are being recorded in the database that this error does not occur.	
Accept other relevant answers.	

Question 27 **(31 marks)**

(a) Analyse the issues in the existing network diagram. (5 marks)

Description	Marks
Analyses the existing network setup using examples from the network diagram.	5
Discusses the existing network setup using some examples from the network diagram.	4
Explains the existing network setup some examples from the network diagram.	3
Describes the existing network setup with limited to no examples from the network diagram.	2
Limited information provided about the existing network setup with limited to no examples from the network diagram is provided.	1
Total	**5**
Answers could include: The analysis of the network indicates that security was not a factor with no firewall used in the network. Also, routers were not used within the network which is also a security factor. The network is also inadequately managed by switches and the company printer has been placed in a public place rather than being private. The network as it stands is not adequate for the business requirements.	
Accept other relevant answers.	

(b) Explain a method the internet café could use to ensure its network is secure. (3 marks)

Description	Marks
Explains a method that could be used to ensure its network is secure.	3
Describes a method that could be used to ensure its network is secure	2
Identifies a method that could be used to ensure its network is secure.	1
Total	**3**
Answers could include: • install a firewall and access control within the network to protect against unauthorised access by the public • installation of a router to isolate the office network from the internet café • install a printer for office use only.	
Accept other relevant answers.	

(c) Describe which protocol the wireless access point uses to detect collisions. (2 marks)

Description	Marks
Describes which protocol the wireless access point uses to detect collisions.	2
Identifies which protocol the wireless access point uses to detect collisions.	1
Total	**2**
Answers could include: The wireless access point uses Carrier-Sense multiple access with collision avoidance or CSMA/CA to avoid collisions that begins transmission only after the channel is sensed to be “idle”.	
Accept other relevant answers.	

(d) Outline **one** reason for how the network design makes the data vulnerable. (2 marks)

Description	Marks
Outlines one reason how the network design makes the data vulnerable.	2
Limited information about how the network design makes the data vulnerable.	1
Total	**2**
Answers could include: The current network design allows any access point to access all parts of the network with no segmentation using routers and/or firewalls have been implemented to improve security.	
Accept other relevant answers.	

(e) Explain why the Point of Sale (POS) system in relation to the network diagram in the Source booklet on page 4, may be experiencing slower network performance on weekends and school holidays. (3 marks)

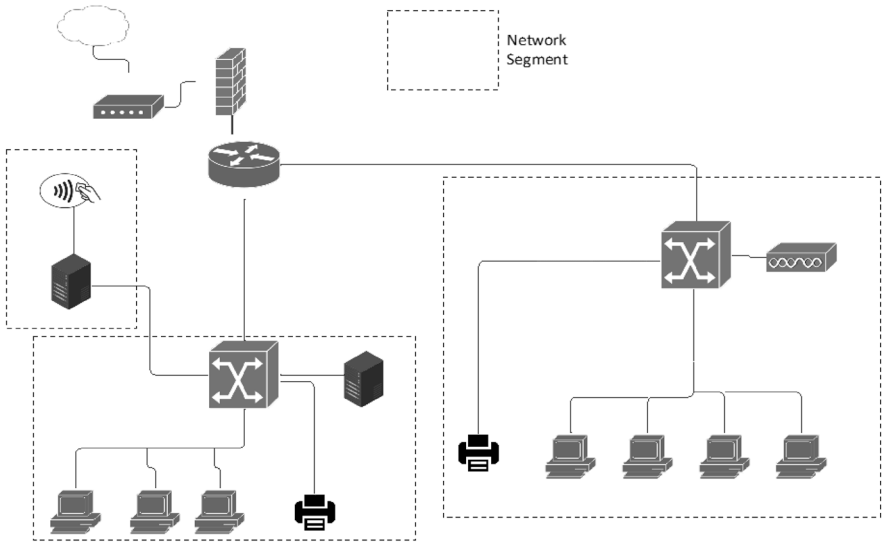
Description	Marks
Explains why the Point of Sale (POS) system may be experiencing slower network performance.	3
Describes why the Point of Sale (POS) system may be experiencing slower network performance.	2
Limited information as to why the Point of Sale (POS) system may be experiencing slower network performance.	1
Total	**3**
Answers could include: The POS system would be experiencing slower network performance on weekends and school holidays due to the network design. At those periods large number of visitors would be using the internet café and the use of unmanaged switches in the network design. The use of unmanaged switches rather than a router would increase the saturation of the network bandwidth including an increase in network collisions.	
Accept other relevant responses.	

Question 27 (continued)

(f) Describe **two** security methods the owners could implement to ensure internet café customers are unable to access their data. (4 marks)

Description	Marks
For each security method (2 x 2 marks)	
Describes the security methods the owners could implement to ensure internet café customers are not able to access their data.	2
Identifies the security methods the owners could implement to ensure internet café customers are not able to access their data.	1
Total	**4**
Answers could include: • encryption of server • using firewall to block/filter access from public facing devices • each employee should have their own log in and password • replace switched with router to block/filter and block public facing devices.	
Accept other relevant answers.	

(g) Design and draw using CISCO symbols an improved network for the company. Include in your answer the transport medium and network segmentation. (12 marks)

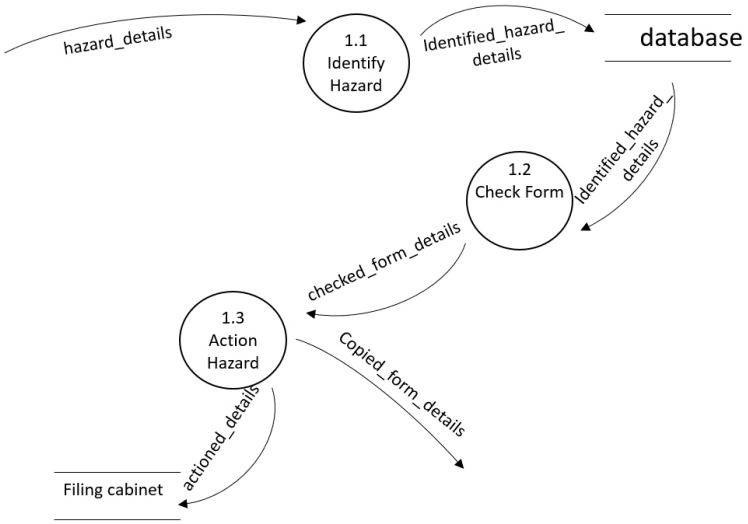
Description	Marks
Appropriate placement of the cloud, modem, firewall	1
New firewall	1
Router/Switch (3 in total: main, POS, Internet café)	1–3
Network segments (Internet café, Office, POS)	1–3
New office printer	1
Appropriate order of devices	1
Identified ethernet connection (CAT6e/fibre optic cables) between WAPs, routers and servers	1
Cisco conventions used	1
Total	**12**
Answers could include:  	
Accept other relevant answers.	

Question 28 **(30 marks)**

(a) Draw a Level 1 data flow diagram (DFD) for the Hazard Reporting System. (7 marks)

Description	Marks
Processes with numbers correct	1–3
Data stores	1–2
Flow to entity (entity symbol is not required)	1
Data flows logically stated	1
Total	**7**

Answers could include:



Accept other relevant answers.

(b) Write the Module *WorkCompleted* in pseudocode. This module allows the manager to:
- input yes or no to identify if the work has been completed
- output “Hazard is no longer a risk” if it has been completed
- output “Hazard is still a risk” if the work is incomplete. (5 marks)

Description	Marks
Module begin and end	1
Input verification	1
While statement	1
If statement	1
Print statements	1
Total	**5**

Answers could include:

```
MODULE WorkCompleted (Verification)
      INPUT(Verification)
      WHILE Verification <> “Yes” or Verification <> “No” DO
           PRINT “Please enter Yes or No”
           INPUT(Verification)
      END WHILE
      IF Verification = “Yes” THEN
            PRINT “Hazard is no longer a risk”
       ELSE
            PRINT “Hazard is still a risk”
        END IF
END WorkCompleted
```

Accept other relevant answers.

Question 28 (continued)

(c) Write the Module *ActionControl* in pseudocode as a Case statement. This algorithm decides the action based on the hazard. (10 marks)

Description	Marks
Module begin and end	1
Appropriate parameters	1
Iteration statement for correct Hazardtype	1
Case statements	1–7
Total	**10**

Answers could include:

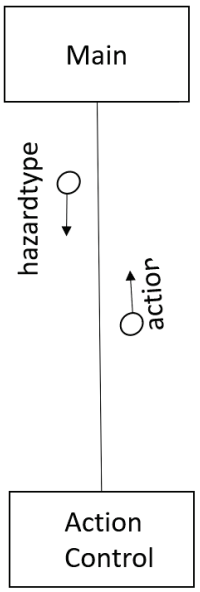
```
MODULE ActionControl (Hazardtype, Action)
        WHILE Hazardtype < 1 or > 7 DO
                INPUT (Hazardtype)
        End WHILE
        CASE Hazardtype OF
                1:Action <- “Block and clean up area"
                2:Action <- “Call 000"
                3:Action <- “Call Electrician"
                4:Action <- “Call Manager"
                5:Action <- “Block and clean up area"
                6:Action <- “Block and clean up area"
                7:Action <- “Manager decides"
        END CASE
END ActionControl
```

Accept other relevant answers.

(d) Create a structure chart for this algorithm in part (c). Include all passing parameters.
(8 marks)

Description	Marks
Modules named appropriately (Main and Action Control)	1–2
Parameters named appropriately (Hazard type and Action)	1–2
Parameter directions are appropriate	1–2
Appropriate symbols for modules and connection	1–2
Total	**8**

Answers could include:



Accept other relevant answers.

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