



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/ NATIONAL SENIOR CERTIFICATE EXAMINATIONS

INFORMATION TECHNOLOGY P2

MAY/JUNE 2025

MARKS: 150

TIME: 3 hours

This question paper consists of 15 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX sections:

SECTION A:	Short Questions	(20)
SECTION B:	Systems Technologies	(30)
SECTION C:	Communication and Network Technologies	(25)
SECTION D:	Data and Information Management	(25)
SECTION E:	Solution Development	(20)
SECTION F:	Integrated Scenario	(30)

2. Read ALL the questions carefully.
3. Answer ALL the questions.
4. The mark allocation generally gives an indication of the number of facts/reasons required.
5. Number the answers correctly according to the numbering system used in this question paper.
6. Write neatly and legibly.

SECTION A: SHORT QUESTIONS

QUESTION 1

- 1.1 Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 D.

- 1.1.1 Which ONE of the following is NOT a reason for the digital divide?
- A Lack of internet connection in certain areas
 - B People with disabilities find it difficult to use ICT
 - C Information overload
 - D Lack of exposure to technology
- (1)
- 1.1.2 Software that translates the code line by line into machine language, while the program is running:
- A Compiler
 - B API
 - C Interpreter
 - D Driver software
- (1)
- 1.1.3 A programming technique used to test whether a user's input is in an acceptable range and ensures that data meets a set of requirements:
- A Verification
 - B Validation
 - C Debugging
 - D Encryption
- (1)
- 1.1.4 Static web pages where all users see the same content:
- A Web 1.0
 - B Web 2.0
 - C Web 3.0
 - D Semantic web
- (1)
- 1.1.5 The integration of digital information with the user's environment in real time:
- A Virtual reality
 - B VPN
 - C Augmented reality
 - D Geotagging
- (1)

- 1.1.6 A unique number that consists of four sets of numbers from 0–255, separated by periods/dots, e.g. 196.14.2.244:
- A Voice over internet protocol
 - B IP address
 - C URL
 - D Domain name
- (1)
- 1.1.7 Software stored on the ROM chip which contains instructions for the boot-up process of a device:
- A CMOS
 - B BIOS
 - C Operating system
 - D Freeware
- (1)
- 1.1.8 What is the resulting data type of the 'MOD' operator in Delphi programming?
- A Integer
 - B Boolean
 - C Real
 - D String
- (1)
- 1.1.9 The use of data encryption to prevent unauthorised access to digital copyrighted content:
- A SSL
 - B ATM
 - C DRM
 - D POP3
- (1)
- 1.1.10 Any computer or device that provides services and connections to other computers or devices on a network:
- A Client
 - B Host
 - C ISP
 - D Domain
- (1)

1.2 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question numbers (1.2.1 to 1.2.5) in the ANSWER BOOK, e.g. 1.2.6 CPU.

- 1.2.1 A protocol used to leave copies of e-mails on the server to allow users to read, send and organise their e-mails from multiple devices (1)
- 1.2.2 Software that allows the operating system to communicate with and control hardware devices connected to the computer (1)
- 1.2.3 A visual illustration used to describe the relationship between two tables in a database (1)
- 1.2.4 An online platform containing information that allows users to collaborate by adding and editing content (1)
- 1.2.5 A hexadecimal code used to uniquely identify entities, e.g. hardware, software and documents (1)

1.3 Indicate whether the following statements are TRUE or FALSE. Write 'true' or 'false' next to the question numbers (1.3.1 to 1.3.5) in the ANSWER BOOK. If the statement is true, write 'TRUE'. If the statement is false, write 'FALSE' and change the underlined word(s) to make the statement TRUE. (Do NOT simply use the word 'NOT' to change the statement.)

NO mark will be awarded if FALSE is written without a correct answer.

- 1.3.1 A group of people that work together to commit cybercrimes, each with their own speciality is called a botnet. (1)
- 1.3.2 The IRQ is repeated for every instruction executed by the CPU. (1)
- 1.3.3 Multiprocessing is when the computer has more than one CPU core and the operating system splits tasks and processes, in parallel, between the different cores. (1)
- 1.3.4 Leechers are peers that make files available for others to download using BitTorrent. (1)
- 1.3.5 An archive is a duplicate of a file, program or media that can be used if the original file, program or media is lost, damaged or destroyed. (1)

TOTAL SECTION A: 20

SECTION B: SYSTEMS TECHNOLOGIES

QUESTION 2

SCENARIO

Security companies are increasingly utilising home automation systems to provide solutions for their clients. These systems integrate various devices and technologies to enhance security, convenience and efficiency within residential settings.

- 2.1 Mobile technologies play an important role in home automation systems.
- 2.1.1 (a) Briefly explain what *mobile technologies* are. (1)
- (b) State ONE advantage of using mobile devices, such as smartphones or tablets, as remote controllers for home automation systems. (1)
- 2.1.2 Give TWO examples of how mobile technologies can be utilised in enhancing home automation systems. (2)
- 2.1.3 Suggest ONE rule to follow regarding the security of data, when connecting a mobile device to any public Wi-Fi network. (1)
- 2.1.4 Name TWO types of digital input that can be captured using mobile devices. (2)
- 2.1.5 Suggest ONE strategy to extend the battery life of mobile devices while maintaining effective system operation. (1)
- 2.2 The storage of data related to video monitoring using CCTV (closed circuit television) cameras is key to the safety of residents.
- 2.2.1 State TWO factors that determine the quality of a CCTV camera. (2)
- 2.2.2 Explain why an SSD is considered to be more durable AND how it impacts on the maintenance of the drive. (2)
- 2.2.3 Motivate why an SSD is a better storage device than an HDD, excluding the answer that you gave to QUESTION 2.2.2. (2)
- 2.3 The use of secure methods to access sensitive information is critically important to a security company.
- Explain ONE advantage of using biometric authentication over traditional password-based authentication. (2)

- 2.4 A high-performance computer/laptop and a speaker system are used by the company to do presentations during meetings.
- 2.4.1 Explain how bus performance can have an influence on the performance of a computer system. (2)
- 2.4.2 Explain how the CPU clock speed and multiprocessing capabilities are able to increase the overall performance and efficiency of a computer system. (3)
- 2.4.3 Discuss how the RAM influences the performance of a computer system. (2)
- 2.4.4 Which expansion card is required if the speaker system must be connected to a motherboard with a limited number of auxiliary ports? (1)
- 2.5 The use of cloud computing in home automation can have many risks and benefits.
- 2.5.1 Explain the concept of scalability in terms of cloud computing. (2)
- 2.5.2 State TWO advantages of using SaaS solutions in cloud computing environments. (2)
- 2.5.3 State TWO security concerns associated with cloud computing. (2)

TOTAL SECTION B: 30

SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

QUESTION 3

Security companies rely heavily on communication and network technologies to improve access to data on a global scale.

- 3.1 A security company utilises a network on their premises.
- 3.1.1 Briefly explain what a *NOS (network operating system)* is AND its role in a networked environment. (2)
 - 3.1.2 Besides workstations, computing devices and servers, name TWO other essential components required to establish a connection between nodes in a network. (2)
 - 3.1.3 Evaluate the importance of user rights management in a networked environment. (2)
 - 3.1.4 State ONE possible disadvantage of using a network. (1)
- 3.2 Having a network connected to the internet has many risks associated with the safety and security of data.
- 3.2.1 State any TWO requirements of a local network to obtain access to the internet. (2)
 - 3.2.2 Describe the role of certificate authorities (CAs) in the context of digital certificates and SSL encryption. (2)
- 3.3 The security company is considering implementing a wireless local area network at their premises.
- 3.3.1 Justify the use of Ethernet cables versus wireless media. (2)
 - 3.3.2 Describe the function of a wireless base station in a wireless network. (2)
- 3.4 A laptop supplied to one of the employees at the security company has two NICs.
- Motivate why the employee's laptop should have two NICs instead of one. (2)

- 3.5 Location-based computing is used by the security company in many aspects of their business.
- 3.5.1 State TWO other aspects that are required, besides mobile devices, for effectively using location-based services. (2)
- 3.5.2 Briefly explain TWO benefits for the company when using location-based services. (2)
- 3.6 A local shop supplying security devices to the company will need to take stock of their devices once a week.
- 3.6.1 Briefly explain how RFID technology can be used to improve the stocktaking process. (2)
- 3.6.2 Identify TWO potential challenges that the security company might encounter during the implementation of RFID technology for stock taking. (2)
- TOTAL SECTION C: 25**

SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4

A home automation system keeps track of activities on devices within a smart home.

A database with a table called **tblDevices** is used in the system. The table contains the following fields:

Field	Description
DeviceID (Primary Key)	A unique ID for each device
DeviceName	The name of the device
RoomName	The name of the room where the device is located
RoomArea	The area of the room where the device is located (measured in m ²)
DeviceStatus	The status of the device – if the device is currently on or off/open or closed
StartTime	A time when the device should switch on/activate
EndTime	A time when the device should switch off/deactivate

Example of the first 11 records of the **tblDevices** table:

DeviceID	DeviceName	RoomName	RoomArea	DeviceStatus	StartTime	EndTime
1	Aircon	Sitting room	22	☒	12:00	16:00
2	Lights	Sitting room	22	☐	17:00	22:00
3	TV	TV room	25	☒	17:15	23:30
4	Alarm	Garage	18	☒	23:00	6:00
5	Aircon	Bedroom1	24	☒	11:00	15:00
6	Aircon	Bedroom2	20	☐	12:00	17:00
7	Lights	Bedroom1	24	☒	19:30	22:00
8	Sound system	TV room	25	☐	17:00	18:00
9	Coffeemaker	Kitchen	27	☐	6:30	7:00
10	Window blinds	Bedroom1	24	☒	7:00	18:30
11	Window blinds	Bedroom2	20	☒	7:30	18:00

4.1 The **DeviceID** field is the primary key in the **tblDevices** table.

4.1.1 Briefly explain what a *primary key* in a database table is. (1)

4.1.2 Justify why the field **DeviceID** is a suitable primary key in the table **tblDevices**. (2)

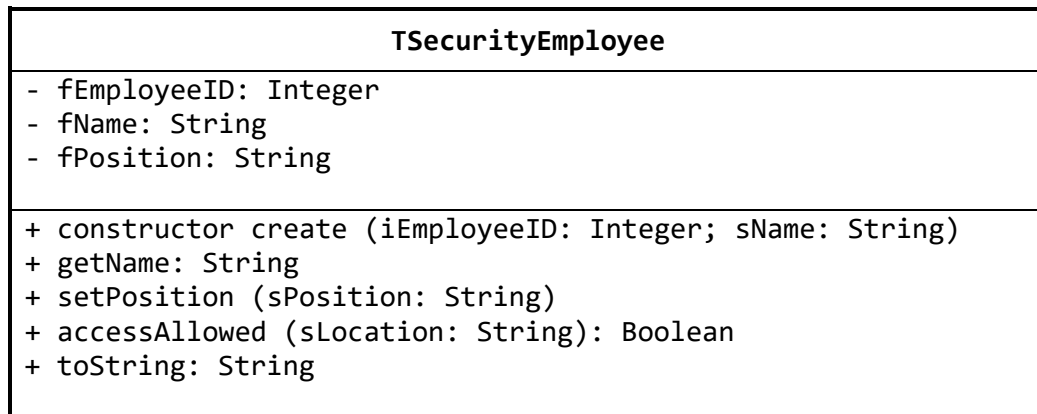
- 4.2 Redundant fields in a table are removed during the process of normalisation.
- 4.2.1 Evaluate the design of the **tblDevices** table and establish whether a redundant field exists in the table.
- Give a brief explanation to substantiate your conclusion. (2)
- 4.2.2 Discuss how having redundant data could affect the efficiency of the database. (2)
- 4.3 Suggest an improved design/structure for the table **tblDevices** by separating the table into TWO tables.
- Indicate the primary and foreign keys, where applicable, including the relationship type that must be established between the tables. (6)
- 4.4 Each field in a table must have a data type.
- 4.4.1 Identify the most suitable data type for EACH of the following fields:
- (a) DeviceStatus (1)
- (b) StartTime (1)
- 4.4.2 Discuss the importance of using appropriate data types during database design. (2)
- 4.5 The data from the table **tblDevices** is stored by the security company.
- 4.5.1 Discuss a potential privacy issue related to the collection and storage of data from devices within a smart home. (2)
- 4.5.2 State TWO measures that could be implemented to address the issue, discussed in QUESTION 4.5.1, while still maintaining the benefits of home automation. (2)
- 4.6 Describe how changes made in a database can be tracked. (2)
- 4.7 Metadata is additional information about a database that is saved in a file or within the database.
- Name TWO items that typically form part of the metadata of a database. (2)

TOTAL SECTION D: 25

SECTION E: SOLUTION DEVELOPMENT

QUESTION 5

- 5.1 You have been provided with the following class diagram for a security employee object, as well as a line of code:



An object was declared in the main form using the following code:

```
objSecurityEmployee : TSecurityEmployee;
```

- 5.1.1 The plus (+) and the minus (-) symbols in the class diagram indicates whether the attributes and methods have public or private scope.

- (a) Why would the following code in the main form provide an error during runtime?

```
objSecurityEmployee.fName := 'Johann'; (1)
```

- (b) State any TWO ways in which to change the value of a private attribute from a different form/class. (2)

- 5.1.2 The **getName** method is known as an accessor method.

Explain why an accessor method normally does not have a parameter. (1)

- 5.1.3 Identify TWO auxiliary methods in the class diagram. (2)

- 5.1.4 The name of the employee and whether he/she has access to a specific location must be displayed. A string with the necessary information must be returned to the main form.

Motivate why the **toString** method will not be used for this purpose. (2)

- 5.1.5 Study the following Delphi code that is used to instantiate a new objSecurityEmployee object and answer the question that follows:

```
objSecurityEmployee := TSecurityEmployee.create();
```

Briefly explain what TSecurityEmployee refers to. (1)

- 5.1.6 Write Delphi code for a method called determineInitial, that will return the first letter (initial) of a security employee's name.

NOTE: You can assume that a security employee has only one name. (2)

- 5.2 The number of tiles that will be required to tile a room must be calculated. The following Delphi code has been provided:

```
tilesRequired := Ceil(AreaOfRoom / AreaOfSingleTile);
```

Explain the purpose of the function **Ceil**, and its relevance in calculating the total number of tiles required. (3)

- 5.3 A global array with the following declaration was provided:

```
arr : array[1..10] of Integer = (10, 20, 30, 40, 50, 60, 70,  
                                80, 90, 100);
```

Study the Delphi code below and answer the questions that follow:

```
1: var  
2:     i, j, temp: Integer;  
3: begin  
4:     for i := length(arr) downto 1 do  
5:         begin  
6:             j := Random(i) + 1;  
7:             temp := arr[i];  
8:             arr[i] := arr[j];  
9:             arr[j] := temp;  
10:        end;  
11: end;
```

- 5.3.1 Assume that the first time the loop was executed, a random number 7 was assigned to the variable j.

Show the content of the array after the first iteration of the loop. (2)

- 5.3.2 Explain the purpose of the + 1 part of the statement in line 6 in the context of the provided code:

Line 6: j := Random(i) + 1; (2)

- 5.3.3 State the purpose of the code provided in lines 1 to 11. (2)

TOTAL SECTION E: 20

SECTION F: INTEGRATED SCENARIO

QUESTION 6

Home automation systems have become more common in households.

- 6.1 Some companies offering home automation services enable users to pay for services using cryptocurrency.
- 6.1.1 Cryptocurrency utilises blockchain technology.
- Define the term *blockchain* in this context. (2)
- 6.1.2 State TWO disadvantages of using blockchain technology for the company. (2)
- 6.2 Compression technologies in home automation systems are used when storing files and when home owners stream videos from their systems.
- Name the most suitable compression file type used to save space for the following files:
- 6.2.1 Image files (1)
- 6.2.2 Video files (1)
- 6.3 Physical integrity issues have been identified on some of the storage devices.
- 6.3.1 Define the concept of *physical integrity*. (2)
- 6.3.2 State TWO factors that affect the physical integrity of storage devices. (2)
- 6.4 The website used to monitor the automation system at a home uses both private and public encryption techniques.
- Differentiate between *private key encryption* and *public key encryption* within the context of SSL encryption. (2)
- 6.5 The Fourth Industrial Revolution is an integration of technologies, such as IoT, robotics, AI, AR, big data and VR, to change the way people live and work.
- 6.5.1 Define *virtual reality (VR)*. (2)
- 6.5.2 Name TWO types of smartphone features/sensors that is required for using AR. (2)
- 6.5.3 Give any possible use of IoT in a home automation system. (1)

6.6 Home automation devices can be used as zombies.

6.6.1 Explain what a *zombie* is. (2)

6.6.2 Why would a cybercriminal create and use a zombie device? (1)

6.7 Protecting one's online identity is vital.

6.7.1 State TWO ways in which users can protect their online identity. (2)

6.7.2 Motivate why updating software can contribute towards a user's online safety. (1)

6.8 The AJAX-based semantic web search widget shown below has been integrated into the website of an automation management company.

Destination country
Start typing your country to see suggestions:

Unit ▼

United Arab Emirates

United Kingdom

United States

6.8.1 Explain the purpose of using AJAX as part of a website. (2)

6.8.2 Discuss the role that AI can play in enhancing the semantic search. (2)

6.9 Home automation devices must be delivered to households using a courier company.

Two different users have used the word 'RAM' to obtain information about courier companies online. Information about a courier company was displayed to the first user, while information about computer hardware was displayed to the second user.

Explain why this happened by referring to a customised search in your answer. (3)

TOTAL SECTION F: 30
GRAND TOTAL: 150



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MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 20 pages.

SECTION A: SHORT QUESTIONS

QUESTION 1

1.1	1.1.1	C ✓	Information overload	(1)
	1.1.2	C ✓	Interpreter	(1)
	1.1.3	B ✓	Validation	(1)
	1.1.4	A ✓	Web 1.0	(1)
	1.1.5	C ✓	Augmented Reality	(1)
	1.1.6	B ✓	IP address	(1)
	1.1.7	B ✓	BIOS	(1)
	1.1.8	A ✓	Integer	(1)
	1.1.9	C ✓	DRM	(1)
	1.1.10	B ✓	Host	(1)
1.2	1.2.1	IMAP ✓		(1)
	1.2.2	Driver ✓		(1)
	1.2.3	ERD / Entity relationship diagram ✓		(1)
	1.2.4	Wiki ✓		(1)
	1.2.5	Global Unique Identifier/GUID ✓ also accept UUID		(1)
1.3	1.3.1	False, Cyber gang ✓		(1)
	1.3.2	False, Machine cycle ✓		(1)
	1.3.3	True ✓		(1)
	1.3.4	False, Seeders ✓		(1)
	1.3.5	False, backup ✓		(1)

TOTAL SECTION A: 20

SECTION B: SYSTEMS TECHNOLOGIES

QUESTION 2

- 2.1 2.1.1 (a) *Briefly explain what mobile technologies are:*
- Provide communication/access to information/devices while on the move ✓ /away from traditional wired environments.
OR
Portable devices to access information. (1) (1)
- (b) *Any ONE advantage of using mobile devices as remote controllers for home automation systems: ✓*
- Convenience and reliability of being always on/always connected
 - Convenience of only requiring one device (convergence)
 - Supports ubiquity
- Also accept any other relevant and correct answer. (1)
- 2.1.2 *Any TWO examples of how home automation is enhanced with mobile devices: ✓✓*
- Integration with IoT devices:
- Receive real-time alerts
 - Notifications on their smartphones when
 - motion is detected by security cameras,
 - specific conditions are met
- Also accept specific examples:
- Answers relating to using the GPS in a mobile device
 - Doors are opened
 - Open curtains
 - Switch on lights
 - Check the condition of your systems e.g. batteries. (2)
- 2.1.3 *Any ONE rule to follow, regarding the security of data, when connecting a mobile device to any public Wi-Fi network: ✓*
- Connect to an approved / secure / encrypted wireless network
 - Limit your activity to simple web surfing or watching online videos
 - Avoid sending / entering / accessing confidential information that could be intercepted
 - Ensure that your device has anti-malware installed
- Also ACCEPT any other relevant and correct answer. (1)

2.1.4 Any **TWO types** of digital input that can be captured using mobile devices: ✓✓

- Voice / Audio input
- Video input
- Image/pictures input e.g. QR-Codes
- Biometric input e.g. Fingerprints
- Sensor input e.g. GPS/Location
- Touchscreen input

(2)

2.1.5 Any **ONE** strategy to extend the battery life of mobile devices while maintaining effective system operation: ✓

- Adjust power settings
- Manage background apps
- Reduce screen brightness
- Manage connectivity
- Optimise application usage
- Update software

(1)

2.2 2.2.1 Any **TWO** factors that determine the quality of a CCTV camera: ✓✓

- Resolution
- Sensor type
- Sensor size / Camera size
- Pixel size and count
- Lens quality
- Aperture size
- Frame rate
- Low light performance
- Image sensor
- Field of view
- Compression algorithm used
- Advanced features such as Wide Dynamic Range (WDR), infrared (IR) capabilities for night vision, and image stabilisation.

(2)

2.2.2 Explain why an SSD is considered to be more durable and how this impacts on the maintenance of the drive:

SSD's do not have moving parts / stores electronically ✓ and are easier to maintain as they are less prone to physical damage. ✓

(2)

- 2.2.3 *Motivate why an SSD is a better storage device than an HDD, excluding the answer provided in Question 2.2.2:*

Allocate marks:

Concept ✓

Explanation ✓

Speed and Access Time:

SSDs: The electronic nature of SSDs leads to significantly faster data access and transfer speeds compared to HDDs.

HDDs: The mechanical nature of HDD's leads to slower data access times and transfer speeds compared to SSDs.

OR

Boot Time and System Responsiveness:

SSDs: Due to their fast read/write speeds, SSDs contribute to faster boot times and overall system responsiveness.

HDDs: HDDs generally result in longer boot times and slower system responsiveness compared to SSDs.

OR

File Transfer and Copy Operations:

SSDs: SSDs excel in file transfer and copy operations, offering rapid data transfer rates.

HDDs: While HDDs can handle file transfer and copy operations, they are slower compared to SSDs.

(2)

- 2.3 *Explain ONE advantage of biometric authentication over traditional password-based authentication.*

Biometric traits are unique to each individual, ✓ difficult to replicate ✓ / unlike passwords, which can be forgotten, shared, or easily guessed.

Concepts:

- Advantage (1)
- Explanation (1)

(2)

- 2.4 2.4.1 *Explain how bus performance can have an influence on the performance of a computer system:*
- Bus performance determines the speed at which data is transferred ✓ between the components. ✓ (2)
- 2.4.2 *Explain how the CPU clock speed and multiprocessing capabilities are able to increase the overall performance and efficiency of a computer system:*
- A higher CPU clock speed enables the device to process more instructions per second. ✓
The multiprocessing capabilities enable the splitting of tasks/processes between the different cores of the CPU ✓ that are executed simultaneously/parallel. ✓ (3)
- 2.4.3 *Any ONE explanation of the importance of RAM in influencing the performance of a computer system: ✓✓*
- Located close to the CPU (1) which allows the CPU to access data and instructions quickly during active tasks. (1)
 - A larger RAM capacity allows the system to store more data and programs in memory (1), reducing the need to access slower storage devices frequently. (1)
 - RAM acts as a bridge between CPU caches and permanent storage (1), ensuring that data can be transferred between them at high speeds. (1)
 - More RAM (1) allows efficient multitasking / limits paging. (1) (2)
- 2.4.4 *Which expansion card is required if the speaker system must be connected to a motherboard with a limited number of auxiliary ports?*
- Sound / Audio card ✓ (1)
- 2.5 2.5.1 *Explain the concept of scalability in terms of cloud computing:*
- Scalability in cloud computing refers to the ability to handle increasing/decreasing workloads ✓ by efficiently adding or removing resources. ✓ (2)

2.5.2 *Any TWO advantages of using SaaS: ✓✓*

- No upfront infrastructure costs / saving on local resources like storage and processing power
- Software always up to date / Always access to the latest version
- Synchronisation of data
- Pay-Per-Use model
- Scalability
- Ubiquity
- Cross-Platform compatibility
- Maintenance and support available
- Minimal setup

(2)

2.5.3 *Any TWO security concerns associated with cloud computing: ✓✓*

- Data breaches / Data could be hacked
- Data visibility / Unauthorised access / Limited Access Controls
- Service outages / server down / DDOS attacks
- Data loss / SaaS provider closing down

(2)

TOTAL SECTION B: 30

SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

QUESTION 3

- 3.1 3.1.1 *Briefly explain what a NOS is (Network Operating System) AND its role in a networked environment.*
- System software installed on a server ✓ to manage and control other computing devices connected to the network. ✓ (2)
- 3.1.2 *Any TWO essential components, besides network enabled devices required to establish a network connection between nodes: ✓✓*
- Network Interface Card (NIC)
 - Communication media e.g. Cables / UTP / Fibre cables / Wireless
 - Connecting devices such as switches, routers, modems, repeaters, bridges
 - Wireless base station / access point (2)
- 3.1.3 *Evaluate the importance of user rights management in a networked environment:*
- User rights management ensures control ✓ over what resources users can access, modify, or delete within the network. Proper access control reduces the risk of unauthorised access ✓ by limiting users' capabilities to only what is necessary.
- Concepts:**
- User rights management ensures control (1)
 - Unauthorised access - limiting users' capabilities (1) (2)
- 3.1.4 *Any ONE possible disadvantage of using a network: ✓*
- Security risks / network vulnerabilities / cybercrime
 - Complex configurations
 - Network administrator required
 - Infrastructure costs / maintenance and upkeep
 - Single point of failure / service outages (1)

- 3.2 3.2.1 *Any TWO requirements for a local network to obtain access to the Internet: ✓✓*
- ISP Connection / Subscribe to an ISP for internet access
 - Internet Gateway Device / Router / Modem
 - Area must have internet coverage (2)
- 3.2.2 *Any ONE role of Certificate Authorities (CAs) in the context of digital certificates and SSL encryption: ✓✓*
- CAs are entities trusted to issue digital certificates that bind cryptographic keys (such as public keys) (1) to an entity's identity, such as a website, organization, or individual. (1)
 - CAs perform authentication and identity verification processes (1) to ensure that the entity requesting the SSL certificate is legitimate and has control over the domain or server for which the certificate is being issued. (1)
 - CAs use digital signatures to sign SSL certificates they issue. (1) These signatures validate the authenticity and integrity of the certificates. (1)
- Concepts:**
- Role of certificate authority
 - Explain how a certificate authority can be used (2)
- 3.3 3.3.1 *Any justification of the use of Ethernet cables versus wireless connections: ✓✓*
- Ethernet connections are more reliable and stable (1) compared to wireless connections that can be unstable due to physical obstructions and/or weather constraints (1)
 - Ethernet connections have lower latency (1) and faster speeds (1) compared to wireless connections
 - Ethernet connections are not susceptible to common wireless security risks such as Wi-Fi hacking (1), although access to physical connections must be restricted (1)
 - Wired networks are not affected by RF interference (1) leading to signal degradation (1)
- Also ACCEPT any TWO of: (2)**
- Less prone to interferences such as EMI.
 - UTP cables have a higher bandwidth compared to Wi-Fi
 - Better security because data transfer is not as easily intercepted as Wi-Fi
 - Less influenced by objects such as buildings and trees (2)

3.3.2 *Describe the function of a wireless base station in a wireless network.*

A wireless base station serves as a central connection point ✓ for wireless / mobile devices to communicate / connect to the network / Internet. ✓

(2)

3.4 *Motivate why the employees' laptop should have two NIC's instead of one:*

1st NIC: Used for wired connections. ✓

2nd NIC: Used for wireless connections. ✓

Also ACCEPT:

- Acts as a backup (1) with explanation (1)
- Allows to connect to more than one network (1) with explanation (1)

(2)

3.5 3.5.1 *Any TWO aspects needed, besides mobile devices, for effectively using location-based services: ✓✓*

- Positioning system for device / GPS
- Communication networks to enable a device to transfer location data / Satellites / Internet access / Cell tower triangulation
- Location must be activated on the device
- Location based application software required
- Authorising device permissions to access GPS

(2)

3.5.2 *Any TWO benefits to the security company when using location-based services: ✓✓*

- Allows for profiling of customers
- Improved response time by dispatching the nearest security personnel or vehicle
- Automated alerts
- Tracking security guards / vehicles / locations
- Invisible data capturing to provide the company with more information about customers
- Providing specific information / services to specific customers / advertising services to a specific target group

(2)

- 3.6 3.6.1 *How can RFID technology be used to improve the stocktaking process: ✓✓*
- During stock taking, RFID readers automatically identify and track tagged items (1) without requiring line-of-sight scanning or manual barcode scanning (1)
 - RFID technology provides real-time visibility (1) into inventory levels and locations (1)
 - RFID readers can scan multiple RFID tags simultaneously (1), reducing the time and effort required for inventory checks (1)
 - Human errors such as misreads, miscounts, or missed items are minimised (1), leading to more accurate inventory records (1)
 - RFID tags can be used for security (1) and anti-theft purposes (1) (2)
- 3.6.2 *Any TWO potential challenges that the security company might encounter during the implementation of RFID technology for stock taking: ✓✓*
- Large cost of RFID infrastructure
 - Difficult to integrate with existing systems
 - Tagging and tag placement
 - RFID read range and interference
 - Training of employees to use the new technology (2)

TOTAL SECTION C: 25

SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4

- 4.1 4.1.1 A primary key is a unique identifier for each record ✓ in a database table. (1)
- 4.1.2 *Justify why the field **DeviceID** is a suitable primary key in the table **tblDevices**:*
- It is a field that can be used to distinguish one device activity from another, ✓ and it ensures that there are no duplicate entries ✓ for the same device. (2)
- 4.2 4.2.1 *Evaluate the design of the **tblDevices** table and establish whether a redundant field exists in the table. Briefly explain.*
- Yes, DeviceStatus can be determined ✓ using the StartTime and EndTime fields. ✓
OR
No, a user might need to verify if the system clock/timer is working (1) by checking the On/Off status of the device. (1)
OR
Yes, RoomArea field is dependant (1) on the RoomName field. (1) (2)
- 4.2.2 *Any TWO regarding redundant data and how it could affect the efficiency of the database: ✓✓*
- Redundant data can lead to:
 - larger storage requirements (1)
 - slower performance (1)
 - increased chances of data anomalies or inconsistencies (1)
 - Updating redundant data can be complex and time-consuming, leading to maintenance challenges. (1) (2)

- 4.3 Suggest an improved design/structure for the table *tblDevices* by separating the table into TWO tables.

Indicate the primary and foreign keys, where applicable, including the relationship type that must be established between the tables.

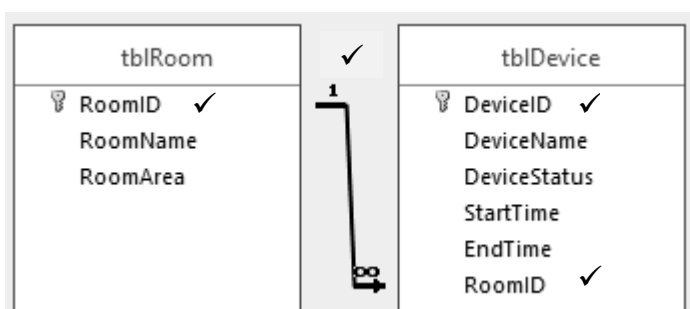
Concepts:

- Create TWO tables, **tblDevice** and **tblRoom** (1)
- Add the fields to the correct tables (1)
- Indicate correct PK's (2)
- Indicate correct FK (1)
- Correct one : many relationship from *tblRoom* to *tblDevice* (1)

Example of possible field names and structure (next page):

NOTE:

- DeviceStatus may be excluded from *tblDevice*
- RoomArea may be excluded from *tblRoom*



✓ Two tables created

✓ Correct fields in each table

(6)

- 4.4 4.4.1 (a) DeviceStatus – Yes/No or Boolean ✓

(1)

- (b) StartTime – DateTime / Time ✓

(1)

- 4.4.2 Any TWO reasons why using appropriate data types are important during database design: ✓✓

- Optimising storage space/storage efficiency
- Facilitating efficient data retrieval and processing / calculations
- Ensuring data integrity / accuracy
- Improving query performance
- Avoiding data inconsistencies
- Limit data anomalies

(2)

4.5 4.5.1 *Discuss any ONE potential privacy implication of collecting and storing data regarding device activities within a smart home: ✓✓*

- Invasion of privacy (1): The data collected can reveal personal habits, routines and behaviours of individuals, which can be exploited or misused. (1)
- Security risks (1): Storing sensitive data can make it a target for hackers, leading to potential breaches, unauthorised access, or misuse of personal information. (1)

Also ACCEPT any other relevant and correct answer. (2)

4.5.2 *Any TWO measures that could be implemented to address the security concerns while still maintaining the benefits of home automation: ✓✓*

- Implementing strong encryption methods / password policies to protect the stored data.
- Regularly updating security protocols / ensuring secure access controls (e.g. biometrics) to limit data exposure / Security risk management with Firewall implementation

(2)

4.6 *Describe how changes made in a database can be tracked: ✓✓*

Concepts:

- Create a parallel data set (1)
- Store all activity within the database in the parallel data set (1)

(2)

4.7 *Any TWO items of information that will form part of the metadata of a database used: ✓✓*

- Table names
- Field names
- Description of field
- Data types
- Primary keys
- Foreign keys
- Relationships
- User permissions
- Size of File
- Size on Disk
- Date Created
- Date Modified

Also ACCEPT any other relevant and correct answer. (2)

TOTAL SECTION D: 25

SECTION E: SOLUTION DEVELOPMENT

QUESTION 5

- 5.1 5.1.1 (a) *Why would the following code in the main form provide an error during runtime?*

objSecurityEmployee.fName := 'Johann';

A private attribute can only be used within the class it is defined in. ✓

Also ACCEPT: fName cannot be used in the main form as it is private in the object class. (1)

(1)

- (b) *Any TWO ways to assign values to a private attribute from a different form/class:*

- Public methods (setMethods / Mutator methods) ✓ / Use of the set method for the corresponding attribute
- Use constructor / Create method to set the attributes to values in the parameter list ✓

(2)

- 5.1.2 *State why the getName method does not have a parameter:*

The **getName** method simply returns the value of the fName attribute. ✓

(1)

- 5.1.3 *Any TWO auxiliary methods from the class diagram:*

+ accessAllowed (sLocation: String): Boolean ✓
+ toString: String ✓

(2)

- 5.1.4 *Any ONE motivation why the toString method will not be used: ✓✓*

- A toString method is used to create and return a string with all the attributes of the object. (1) There is no attribute that describes the access allowed. (1)
- The getName (1) and the accessAllowed methods will be used (1)

(2)

- 5.1.5 *Briefly explain what TSecurityEmpLoyee refers to:*

The object class name. ✓

(1)

5.1.6 Function determineInitial : char ✓
 Begin
 Result := fName[1]; ✓
 End;

Alternative:

Function determineInitial : String (1)
Begin
 Result := copy(fName,1,1); (1)
End;

(2)

5.2 *Explain the relevance of the function Ceil and its relevance in calculating the total number of tiles required.*

The result is rounded up ✓ to the nearest / higher integer. ✓
Ensures enough tiles to cover the entire area of the room without leaving any uncovered spaces / accommodate a fraction of a tile. ✓

(3)

5.3 5.3.1 *Show the content of the array after the first iteration of the loop.*

(10, 20, 30, 40, 50, 60, **100** ✓, 80, 90, **70** ✓);

Concepts:

- Replace 70 with 100 (1)
- At correct indices (1)

(2)

5.3.2 *Explain the purpose of the + 1 part of the statement in line 6 of the code, in the context of the provided code:*

Ensures that the value that is generated is incremented / changed / adjusted to be in the range from 1 to 10 ✓ which is within the valid index range of array **arr**. ✓

NOTE: Do not accept the range 0 to 10.

(2)

5.3.3 The purpose of the code is to swap each element of the array **arr** with a randomly selected element ✓ starting with the last element down to the first. ✓

(2)

TOTAL SECTION E: 20

SECTION F: INTEGRATED SCENARIO

QUESTION 6

- 6.1 6.1.1 *Define the term blockchain in terms of cryptocurrency:*
- Blockchain is a distributed database / ledger with a growing list of records ✓ (called blocks), linked together using cryptography. ✓ (2)
- 6.1.2 *Any TWO disadvantages of using blockchain technology for the company: ✓✓*
- It is slower than a traditional database as it needs to create hashes, which takes a lot of processing time
 - High cost to a company wanting to implement blockchain
 - The technology requires a lot of computer processing power which uses a lot of energy – negative environmental impact
 - Since blocks cannot be altered it is hard to correct mistakes (2)
- 6.2 *Name the most suitable compression file type used to save space for the following files:*
- 6.2.1 *Image files: ✓*
- JPG / JPEG / PNG (1)
- 6.2.2 *Video files: ✓*
- MPEG / MP4 / AVI / MKV / Webm / MOV / HEVC (1)
- 6.3 6.3.1 *Define the concept of physical integrity:*
- Physical integrity is ensuring that data stays protected / safe (complete and accurate) ✓ against physical threats / (power failure, natural disasters, theft of hardware) ✓ as it is accessed, stored and retrieved. (2)
- 6.3.2 *Any TWO factors that affect the physical integrity of storage devices: ✓✓*
- Mechanical shocks or vibrations / robust handling
 - Exposure to extreme temperatures or humidity levels
 - Power surges or fluctuations
 - Improper handling or installation
 - Dust accumulation
 - Magnetic interference (2)

- 6.4 *Differentiate between private key encryption and public key encryption within the context of SSL encryption:*

Public key encryption uses a pair of keys, a public key and a private key, to encrypt and decrypt data. ✓

Private key encryption uses a single key for both encryption and decryption. ✓

(2)

- 6.5 6.5.1 *Define Virtual reality (VR):*

Virtual reality is an artificial environment ✓ that is created with software. ✓

Any TWO concepts:

- Artificial/simulated environment
- Created with software / computer generated
- Appears as 3D space / interacted with via VR equipment

(2)

- 6.5.2 *Any TWO types of smartphone features/sensors that is required for using AR: ✓✓*

- Camera
- GPS
- Accelerometer / Motion detector
- Gyroscope
- Microphones
- Fingerprint scanners
- Facial recognition
- Touch screen

(2)

- 6.5.3 *Any ONE possible use of IoT in a home automation system: ✓*

- Robotic vacuum cleaners.
- Lights of house can be automatically switched off/on.
- Air-conditioning can be set according to preferences.
- Smart fridges contain cameras that allows a user to view content while shopping.
- Communication between the device and the manufacturer e.g. fault reporting / update

Also ACCEPT any other relevant and correct answer.

(1)

- 6.6 6.6.1 *Explain what a zombie is:*
- The devices infected by malware ✓ that are being controlled by a remote computer. ✓ (2)
- 6.6.2 *Any ONE reason why a cybercriminal would create and use a zombie device: ✓*
- Send spam
 - DDoS attacks / overloading the network with Internet traffic
 - Spread malware
 - Manipulate data
 - Unethical purposes
 - Anonymity – activity is traced back to the IP-address of the zombie and not the cybercriminal (1)
- 6.7 6.7.1 *Any TWO ways how a user would protect their online identity: ✓✓*
- Do not give out personal details
 - Use the block/unfriend features of social media applications
 - Disable cookies
 - Enable privacy setting on social media applications
 - Disable location sharing on applications
 - Limit the use of third-party applications
 - Use strong passwords
 - Use two-factor authentication (2FA / MFA)
 - Avoid suspicious links (2)
- 6.7.2 *Motivate how updating software can ensure your online safety:*
- Any ONE:✓
- Fixes/Prevents security weaknesses in software
 - Adds/Improves security features (1)
- 6.8 6.8.1 *Explain the purpose of using AJAX as part of a website:*
- Update a web page dynamically / as interaction takes place ✓ only reloading the necessary parts of a web page ✓ / without requiring a full page reload / refresh the page (2)

6.8.2 *Discuss the role that AI can play in enhancing the semantic search:*

Artificial intelligence can search for / create images and other creative content ✓, rather than just including keywords and the contextual factors of the user. ✓

(2)

6.9 *Two people have searched for the word "RAM" when looking for courier companies. One of them gets results about a courier company and the other gets results about computer hardware.*

Explain why this happened by referring to a customised search in your answer.

Over time users generate a digital footprint / history containing information about their preferences and online browsing activity / searches. ✓

Their digital footprint / history is used to generate more relevant results when they perform a search. ✓

The results are generated by / based on an algorithm that takes personal preferences, browsing behaviour, and geographical location into account ✓

Concepts:

- Personalisation
- History / previous searches
- Results are based on an algorithm

(3)

TOTAL SECTION F: 30
GRAND TOTAL: 150