basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS

INFORMATION TECHNOLOGY P2

2023

MARKS: 150

TIME: 3 hours

This question paper consists of 19 pages.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of SIX sections:

SECTION A:	Short Questions	(15)
SECTION B:	Systems Technologies	(25)
SECTION C:	Communication and Network Technologies	(30)
SECTION D:	Data and Information Management	(20)
SECTION E:	Solution Development	(20)
SECTION F:	Integrated Scenario	(40)

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 Choose a term from COLUMN B that matches the description in COLUMN A. Write only the letter (A–Q) next to the question numbers (1.1.1 to 1.1.10) in the ANSWER BOOK, e.g. 1.1.11 R.

COLUMN A		COLUMN B	
1.1.1	A set of data that describes and provides information about other data	A	WWW
1.1.2	A collection of fields that contains data on a specific entity	B	debugging
1.1.3	A unit of measurement for network bandwidth and throughput	C	mp3
1.1.4	Technique used to avoid programs from crashing during execution	D	defragmenting
1.1.5	A network of online content that is interlinked and accessed over the internet	E	metadata
1.1.6	Unwanted, unsolicited digital communication that gets sent out in bulk	F	plug-in
1.1.7	A software component that adds a specific feature to an existing computer program	G	argument
1.1.8	A variable in the header of a subroutine used as input to the subroutine	H	Mbps
1.1.9	A data compression format for encoding digital audio, most commonly music	I	mediated search
1.1.10	A data searching technique where a search query aims to not only find keywords, but also to determine the intent and contextual meaning of the keywords	J	phishing
		K	record
		L	semantic search
		M	JPG
		N	exception handling
		O	spam
		P	GHz
		Q	parameter

(10)

1.2 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 (1.2.1 to 1.2.5) in the ANSWER BOOK, e.g. 1.2.6 D.

1.2.1 Which ONE of the following is a protocol that provides privacy to users when they work on a public network like the internet?

A HTML
B VoIP
C VPN
D FTP (1)

1.2.2 A group of computers infected by the same malware that work together to perform cyberattacks is known as ...

A cyber gangs
B rootkits
C botnets
D hackers (1)

1.2.3 … is the process of analysing large volumes of data to find patterns and trends.

A Data validation
B Data warehousing
C Data encryption
D Data mining (1)

1.2.4 What will be the value of `K` after the program segment below has been executed?

```
sWord ← 'abcde'
K ← 0
while (length(sWord) <= 20)
 begin
    sWord ← sWord + sWord
    K ← K + 1
 end while
```

A 3
B 4
C 5
D 6 (2)

TOTAL SECTION A: 15

SECTION B: SYSTEMS TECHNOLOGIES

QUESTION 2

An ICT system must be implemented for a national television station running a talent show. Each of the judges will be provided with a laptop that has the following specifications:

Specifications:

- Intel N4020 processor
- 11.6' HD Touch
- MediaTek graphics processor
- 4 GB LPDDR4
- 16 GB eMMC SSD
- Gigabit Wi-Fi 5
- Bluetooth 5.0
- Google Chrome
- Office 365

2.1 Each laptop has two processors, an Intel N4020 processor (CPU) and a MediaTek graphics processor (GPU).

2.1.1 State the purpose of a central processing unit (CPU). (1)

2.1.2 Most modern processors are multicore processors using multicore technology.

(a) Explain what the term *multicore* refers to in terms of CPU design. (2)

(b) Name ONE processing technique that will allow the full benefit of multicore technology to be utilised. (1)

(c) Explain why multicore technology is able to improve the performance of a processor. (2)

2.1.3 Motivate why including a graphics processor would have a positive impact on the performance of the laptop. (2)

2.2 The 11.6' HD Touch specification refers to the screen of the laptop.

2.2.1 Explain how the size of a screen is measured. (1)

2.2.2 Some devices have both a VGA and HDMI connector for connecting external display devices.

Indicate which ONE of these connectors is the preferred connector in modern devices. Motivate your choice. (2)

2.3 Each judge's laptop is equipped with a 16GB SSD.

Motivate the use of flash technology in SSD devices by stating TWO positive properties of flash disk technology. (2)

2.4 The laptops are networked wirelessly during the talent show.

Explain why Wi-Fi would be better suited to connect to a wireless network than Bluetooth. (2)

2.5 Windows 11 has been installed as an operating system on each laptop.

2.5.1 Define the term *operating system*. (2)

2.5.2 While Windows 11 is a well-known example of proprietary software, open-source software is also being used widely.

Which ONE of these types of software, proprietary or open-source, would you recommend?

Motivate your recommendation by discussing the merits of using the specific software. (3)

2.6 The Microsoft Office 365 that has been installed on each laptop is only available as a SaaS model.

2.6.1 What does the *SaaS model* entail? (1)

2.6.2 Justify why the use of the SaaS model is the preferred marketing model of many software companies such as Microsoft. (2)

2.7 After the installation of antivirus software, the performance of the laptops decreased.

Explain how the functioning of the antivirus software can contribute to the decrease in the overall performance of a computer. (2)

TOTAL SECTION B: 25

SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

QUESTION 3

Entertainment technology has evolved in the past few years. This industry has embraced communication and network technology to improve access to entertainment content.

3.1 Study the network diagram (FIGURE 1) below and answer the questions that follows.

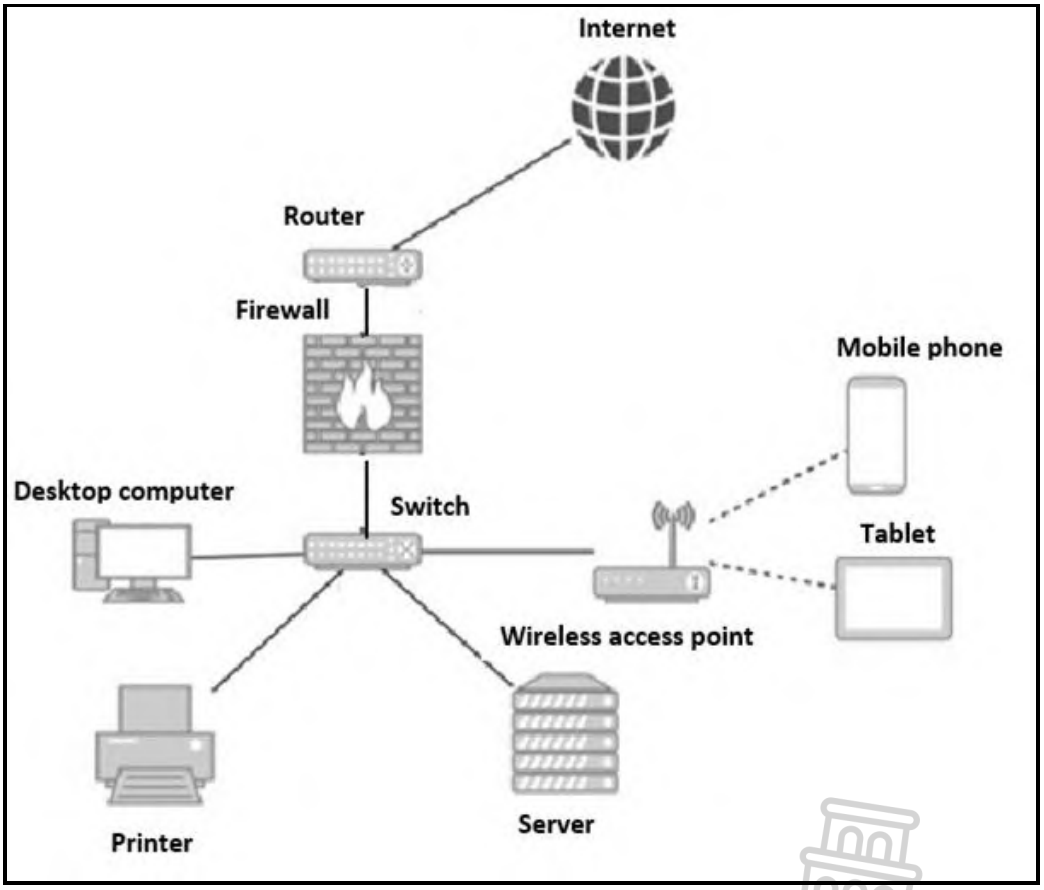


FIGURE 1

3.1.1 State the function of EACH of the following components in a network:

(a) Switch (1)

(b) Wireless access point (2)

(c) Router (1)

(d) Server (1)

3.1.2 A firewall is essential in a network to safeguard against breaches in security.

Name TWO other types of security measures that can be used to safeguard your data on a network. (2)

3.1.3 You have noticed that the Wi-Fi signal strength decreases when it travels through physical objects which causes the transmission rate of the network to decrease.

State TWO other possible causes for the decrease in transmission rate often experienced on Wi-Fi networks. (2)

3.1.4 A friend suggested that BitTorrent be used to download media files.

Explain the process of *torrenting* files from the internet. (3)

3.1.5 A star topology is used for the layout of the network.

(a) State the component in FIGURE 1 that identifies the network layout as being a star topology. (1)

(b) Apart from cost, state the single biggest disadvantage of using a star topology. (1)

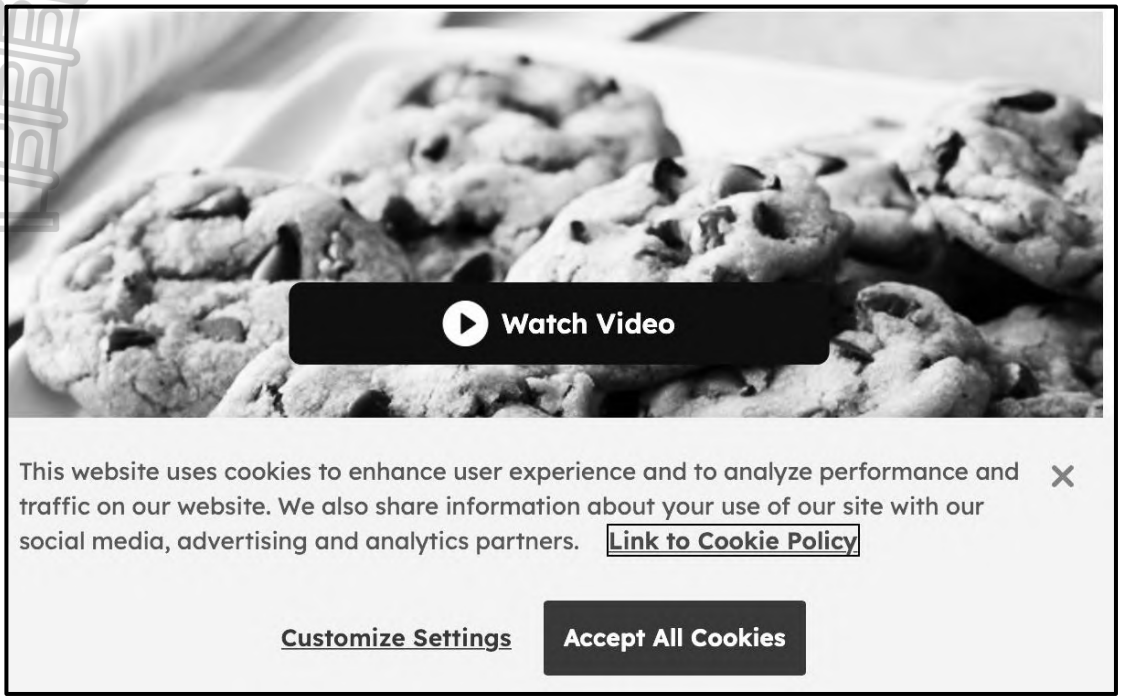
3.2 You have backed up your media files using a cloud service.

3.2.1 Explain the difference between a *file syncing service* and a *backup service*. (2)

3.2.2 State TWO disadvantages of using cloud storage. (2)

3.2.3 Motivate why optical fibre is the recommended choice of a communication medium to upload vast amounts of data to the cloud. (2)

3.3 Your favourite website prompts you to watch a video on cookies.



3.3.1 State whether a cookie is stored *locally* or *online*. (1)

3.3.2 Give an example of data stored by a cookie. (1)

3.3.3 You have noticed that the website has a dedicated app on the app store.

Motivate why an app is sometimes preferred over the use of a browser to visit a website. (2)

3.4 Web 2.0 lead to users browsing social media sites and gaining access to sites where interaction takes place between friends and virtual communities.

3.4.1 (a) What does a *virtual community* refer to in this context? (1)

(b) Name ONE advancement from Web 1.0 to Web 2.0 that made this type of social interaction possible. (1)

3.4.2 The internet has also branched out to the Internet of Things (IoT).

(a) What is the *IoT*? (2)

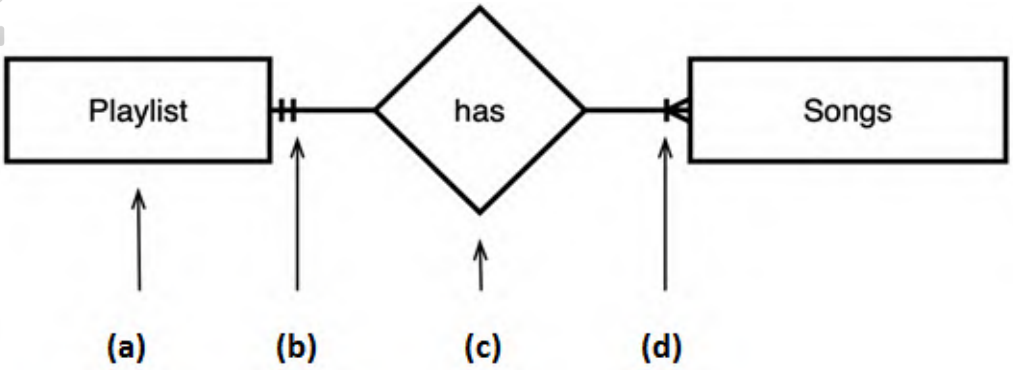
(b) Explain by means of an example how the IoT can be used in a smart home. (2)

TOTAL SECTION C: 30

SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4

4.1 Consider the entity relationship diagram (ERD) below and answer the questions that follow.



4.1.1 What is the purpose of an ERD? (2)

4.1.2 Choose the most suitable term from the list below for the part of the ERD above that is indicated by **(a)** to **(d)**.

NOTE: You are allowed to choose an option from the list ONLY ONCE.

Write down the letter (**(a)** to **(d)**) from the diagram and the selected term from the list below next to the question number (4.1.2).

- Entity
- Relationship
- Attribute
- Many
- One
- Mandatory
- Optional (4)

4.1.3 A primary key needs to be unique when used in a normalised database.

Name ONE other requirement of a primary key. (1)

4.1.4 The design of the **tblPlaylist** table below is an attempt to compile a list of songs for the different genres, with sample data.

Genre	Number of songs	Song 1	Song 2	Song 3	Song 4
Pop	3	Go West	Shaggy	DoBeDo	
R and B	1	Move on			
Country	3	Let's Dance	Jolene	Hey Jude	
Classical	2	Sunset	Phantom		

(a) Critically analyse the design of the **tblPlaylist** table by explaining why the table does not adhere to the rules of normalisation. (2)

(b) Give a reason why it is more suitable to save the playlist information in a database rather than in a text file. (1)

4.2 Your teacher needs to capture your IT marks for the Grade 12 examination. Your total mark out of 150 must be captured as a whole number.

A unique code for each learner must be compiled using the learner's ID number.

Use information above and give an example of how the following data validation techniques can be applied:

4.2.1 Data type check (1)

4.2.2 Range check (1)

4.2.3 Presence check (1)

4.3 Data independence is obtained on multiple levels in modern database management software.

Differentiate between the implication of *physical* and *logical* data independence in developing an application that uses data stored in a database. (2)

4.4 An event agency is managing the income and expenses for entertainment events. A database will be used as a transaction processing system for booking venues and selling tickets.

4.4.1 Explain why related transactions are grouped together during transaction processing. (1)

4.4.2 During the processing of an event booking transaction, the manager was informed that the venue had already been booked.

What is the process that returns the database to its previous state called? (1)

4.4.3 Simultaneous access to the venue bookings table in the database could result in double bookings.

What is the concept called that is applied to prevent simultaneous access to a database table? (1)

4.4.4 The manager at the event agency uses an audit trail.

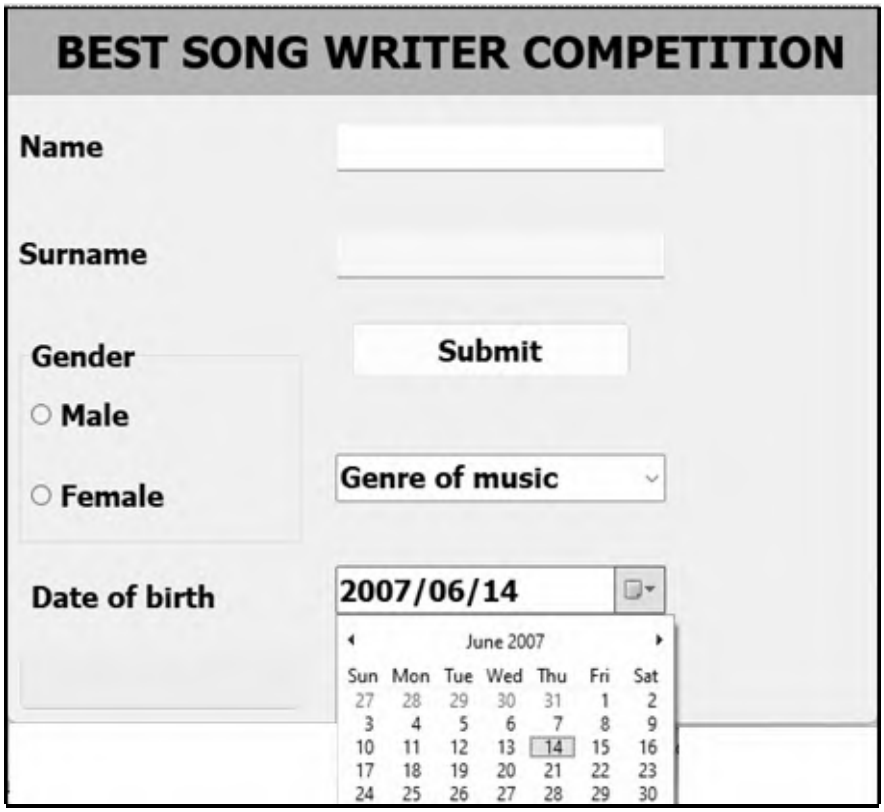
Motivate the need for using an audit trail at the agency. (2)

TOTAL SECTION D: 20

SECTION E: SOLUTION DEVELOPMENT

QUESTION 5

5.1 The application form below was used by a talent search organisation for candidates to enter a song writing competition.



5.1.1 Three selection components were used in the application.

Motivate the use of selection components rather than entry fields for obtaining information from users. (1)

5.1.2 The information captured in the application above will be saved in a text file.

State the benefit of saving the applicants' details in a text file rather than only using an array. (1)

5.1.3 The form requires a button to 'Close' the application.

Why would a bit button be more suitable to be used instead of a standard button? (1)

5.2 The following segment of code was used as a part of a gaming contest. A number from 1 to 6 must be randomly generated. If the number is even, the square root of the number must be calculated, otherwise the square of the number must be calculated.

```
1   procedure TfrmQ5.btnQuestion5_2Click(Sender: TObject);
2   var
3     iNumber, iSqrt, iSquare:Integer;
4     rDivision:Real;
5   begin
6     iNumber := RandomRange(1,7);
7     if iNumber mod 2 = 0 then
8       begin
9          iSqrt := SQRT(iNumber);
10      end
11    else
12      begin
13         iSquare := iNumber * 2;
14      end;
15    rDivision := iNumber / 0;
16    ShowMessage(FloatToStr(rDivision));
17  end;
```

There are many errors in the segment of code above.

Give the line number in the code where EACH of the following errors occur and explain the reason for the error:

5.2.1 Syntax error (2)

5.2.2 Logical error (2)

5.2.3 Runtime error (2)

5.3 A variable **bFlag** has been declared as a Boolean data type.

Indicate whether the following statements are CORRECT or INCORRECT:

5.3.1 The following two lines of code will result in the same answer:

Line 1: `if bFlag then`

Line 2: `if bFlag = True then` (1)

5.3.2 The statement **NOT bFlag** will always produce 'false' as the result. (1)

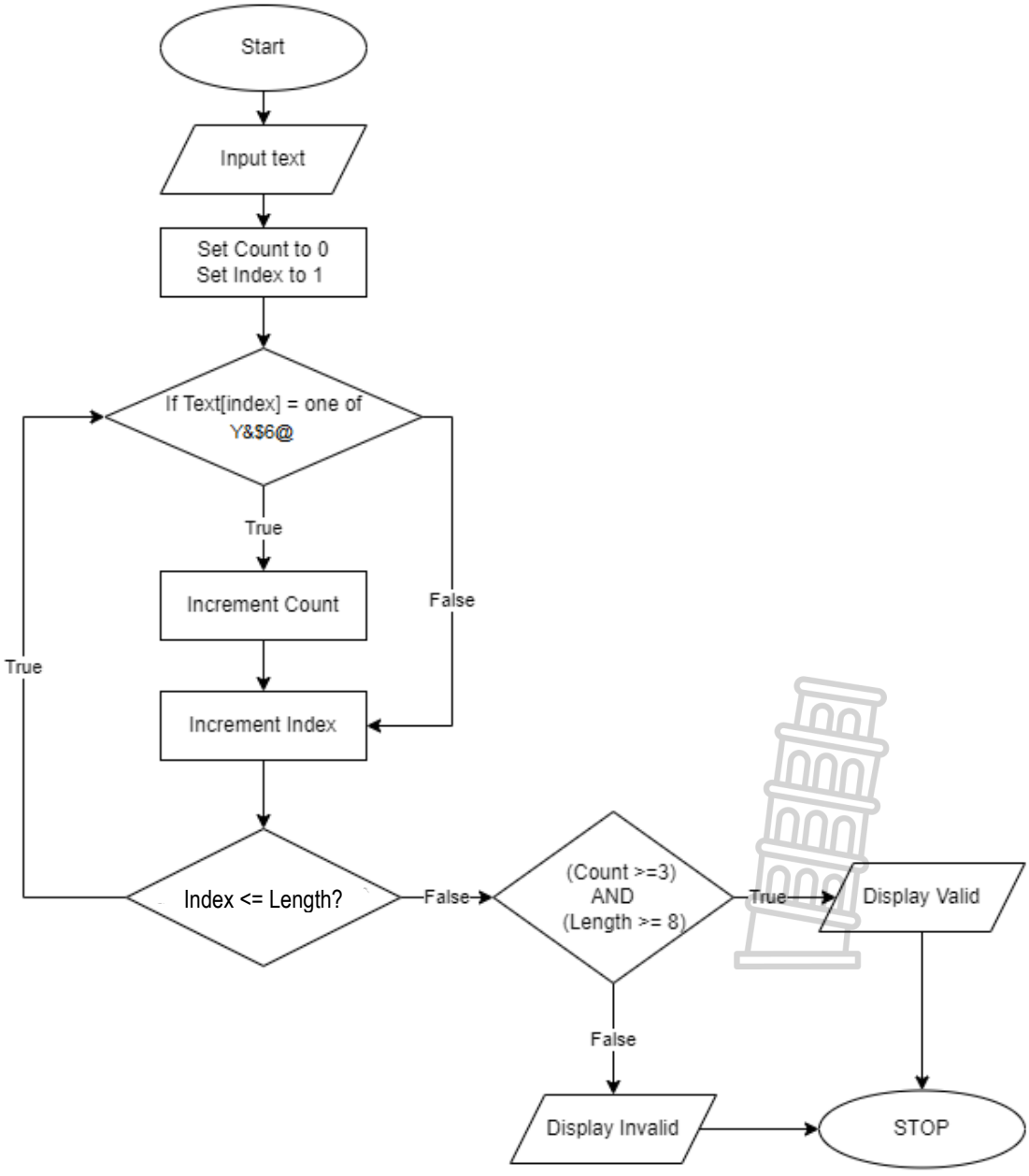
5.4 Classes and objects are key aspects in object-orientated programming.

5.4.1 An access modifier determines the accessibility of the variables and methods of a class.

Give the default access modifier status of an attribute of a class. (1)

5.4.2 Why will a method such as a toString method be declared as public? (2)

5.5 The person responsible for the IT department at the contest has been given the task to determine the output for a program segment, represented by the flowchart below.



NOTE: Length in the flowchart refers to the length of the input text.

The trace table below has been compiled to determine what the output of this program segment will be if the text **Y&$6**@ has been entered as input.

Copy and complete the trace table in your ANSWER BOOK.

Text	Count	Index	Text [Index] = one of Y&$6@?	Index <= Length?	Count >=3 AND Length>= 8?	Display
Y&$6@						

(6)

TOTAL SECTION E: 20

SECTION F: INTEGRATED SCENARIO

QUESTION 6

WatchMore Inc. is an international entertainment company that specialises in streaming television shows and movies.

6.1 WatchMore Inc. provides a video on demand (VOD) service that offers licences to users. These licences allow five devices to access a single subscription.

6.1.1 Define the term *VOD service*. (2)

6.1.2 Each user needs to accept an end-user licence agreement (EULA) when using a VOD service.

State TWO aspects that will be addressed by an EULA. (2)

6.1.3 Some services differentiate between the content that users can access based on the specific country they reside in.

Explain how geo-blocking works to deny users access to certain content of a VOD service. (2)

6.2 Employees at the company might develop health problems due to prolonged hours of editing movies and shows.

Give TWO ergonomic guidelines to avoid potential health problems. (2)

6.3 Providing a VOD service is dependent on the ability to effectively stream content.

6.3.1 Explain why VOD content will be streamed and not downloaded. (2)

6.3.2 Different types of compressions are used for content streamed over networks in order to speed up the streaming process.

(a) What type of compression will be used on the type of content offered on VOD services? (1)

(b) Explain why the answer to QUESTION 6.3.2(a) is most suitable for this type of content. (2)

6.4 The VOD service allows clients to make electronic online payments on their accounts using their secured payment platform.

6.4.1 State ONE way in which the user can determine whether the site providing the payment platform uses a secure connection. (1)

6.4.2 All online transactions are encrypted using a secured socket layer (SSL).

(a) Motivate the need for encryption when doing online payments. (2)

(b) Explain the THREE basic steps of SSL encryption in short. (3)

6.4.3 Explain ONE technique used by cyber criminals to obtain the banking information of internet users. (2)

6.5 The VOD service will have to be able to accommodate a large number of users of the service.

6.5.1 In order to ensure that they can handle large numbers of users, they are making their services scalable.

(a) Explain the concept of *scalability* in this context. (1)

(b) Describe TWO different ways in which virtualisation can be used to make their service scalable. (2)

6.5.2 In order to ensure the availability of the database containing the user accounts, they will be using a distributed database model.

(a) In a distributed database model, the data can be replicated/duplicated or partitioned. Motivate which ONE of these two approaches you will recommend based on the given scenario. (2)

(b) How can you ensure that databases that form part of a distributed database model at a company contain the same information over time as changes are made? (1)

6.6 The production company decided to use a chatbot to deal with enquiries from clients and to communicate with clients in the chat function on their website.

6.6.1 A chatbot is a form of artificial intelligence (AI).

Define *AI*. (2)

6.6.2 State ONE advantage of using a chatbot to deal with user enquiries in this scenario. (1)

6.6.3 Give TWO reasons why it would be more appropriate to use a real person rather than a chatbot to handle user chats. (2)

6.7 A VOD service can have millions of subscribers. In order to establish the popularity of VOD services, service providers store the content choices of all the users.

6.7.1 The scenario above describes the first step in the process of data analytics, namely collecting data.

Discuss any TWO other steps in relation to the scenario by giving a practical example from the scenario. (4)

6.7.2 Data analytics have become extremely challenging in the age of 'big data'.

Discuss TWO specific challenges when working with big data. (2)

6.7.3 The service providers use the information they obtain from the processes or steps followed during data analytics to provide content to users which matches their specific viewing history.

Critically evaluate this practice in terms of possible negative effects/impacts on users. (2)

TOTAL SECTION F: 40
GRAND TOTAL: 150

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2023

MARKING GUIDELINES

MARKS: 150

These marking guidelines consist of 18 pages.

SECTION A: SHORT QUESTIONS

QUESTION 1

1.1	1.1.1	E ✓	Metadata	(1)
	1.1.2	K ✓	Record	(1)
	1.1.3	H ✓	Mbps	(1)
	1.1.4	N ✓	Exception handling	(1)
	1.1.5	A ✓	WWW	(1)
	1.1.6	O ✓	Spam	(1)
	1.1.7	F ✓	Plug-in	(1)
	1.1.8	Q ✓	Parameter	(1)
	1.1.9	C ✓	mp3	(1)
	1.1.10	L ✓	Semantic search	(1)
1.2	1.2.1	C ✓	VPN	(1)
	1.2.2	C ✓	Botnets	(1)
	1.2.3	D ✓	Data mining	(1)
	1.2.4	A ✓✓	Answer: 3	(2)

TOTAL SECTION A: 15

SECTION B: SYSTEMS TECHNOLOGIES

QUESTION 2

2.1 2.1.1 *The purpose of the CPU:*

Performs calculations and other instructions. ✓

Also accept:
Processing of data (1)

2.1.2 (a) *Explain what the term multicore refers to:*

A *processor* that has more than one processing unit/core ✓ on a single processor chip. ✓ (2)

2.1.2 (b) *Any ONE processing technique that will allow the full benefit of multicore technology:* ✓

- Multi-processing
- Multi-threading
- Parallel processing technique (1)

2.1.2 (c) More than one processing core, allows multiple tasks or threads to be processed at the same time ✓ improves the speed at which tasks are completed/done. ✓

Any TWO of the following concepts:

- Due to the use of multiple cores
- Multiple tasks/threads
- Processed simultaneously
- To speeds up the time it takes to complete tasks (2)

2.1.3 Graphics processor has its own resources/processor/RAM which handles the processing of graphical images/rendering ✓, thus lessening the load on the CPU. ✓

Concepts:

- GPU handles processing of images/rendering
- Lessens the load on the CPU (2)

2.2 2.2.1 Diagonally from one corner to the opposite. ✓ (1)

2.2.2 HDMI ✓

ANY ONE motivation for using HDMI: ✓
- It allows for faster transfer of data
- Also carries sound
- Better image quality
- Carrying control signals (2)

2.3 *Any TWO positive properties of flash disk technology:* ✓✓

- High access speeds /higher read/write speeds
- No noise
- Very low heat dissipation
- No moving parts – more robust
- Low power use
- Smaller physical dimensions (2)

2.4 *ANY TWO advantages of Wi-fi compared to Bluetooth*: ✓✓

- Wi-Fi has a higher bandwidth/speed
- The range that a Wi-Fi signal can travel is further than a Bluetooth signal
- Wider variety of devices can connect
- Larger number of devices can be connected
- Wi-Fi has better security (2)

2.5 2.5.1 An operating system is system software ✓ which controls/manages all the activities that take place in a computer. ✓

Concepts:
- System software
- Controls/manages activities or processes (2)

2.5.2 Proprietary OR open-source ✓

Any TWO motivations/reason specific to the software selected: ✓✓

Open-source
- Source code is available for further development
- Can be customised with necessary skills
- Often available for free

Proprietary
- Formal support
- Creators accept greater responsibility for the product
- Fewer versions/more standardised
- Improve integration with other software
- Regular updates and patches
- Updates and features are released throughout the life cycle (3)

2.6 2.6.1 *Any ONE example of what SaaS model entails:* ✓

- Software is not bought, but rented
- Software is accessed over the internet/cloud (1)

2.6.2 *Any TWO of the following merits in SaaS:* ✓✓

- Easier to roll out updates and fixes
- Better control over piracy
- More control of licensing management
- More constant income stream
- Can provide mobile and Web access/Ubiquity
- Faster deployment time
- Scalability / different pricing options / different features (2)

2.7 The antivirus needs to scan files for viruses ✓ before it is executed, adding more tasks that continuously run in background. ✓

Concepts:

- Scanning of files before use
- Taking up resources (2)

TOTAL SECTION B: 25

SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

QUESTION 3

3.1 3.1.1 (a) *Any ONE function of a switch:* ✓

- Connects the devices
- Regenerates signals
- Directs the traffic between devices in the network (1)

3.1.1 (b) *Wireless access point:*

Sends and receives ✓ radio waves. ✓
OR
Makes connection possible to a network (1) by means of radio waves. (1) (2)

3.1.1 (c) *Router:*

Directing data to its correct destination ✓
OR
Allowing communication between different networks/connecting to the internet (1) (1)

3.1.1 (d) *Any ONE function of a server:* ✓

- Provides resources to clients in a network/ share network resources
- Management of access/security (1)

3.1.2 *Any TWO other types of security measures to safeguard your data on a network*: ✓✓

- Using anti-virus/anti-malware software
- Keeping all your software up to date
- Being aware of current trends in computer crime
- Passwords
- Encryption
- Deploying and managing a network policy
- Control user management/Access control
- Perform regular back-ups
- Intrusion detection
- Using a VPN

Also accept any other suitable examples. (2)

3.1.3 *Any TWO possible causes for the decrease in transmission rate on Wi-Fi networks*: ✓✓

- Large number of users connected to AP
- Electromagnetic interference
- Distance from the access point
- Excessive data usage by any connected user
- Impacted by bad weather (2)

3.1.4
- Files are broken up into smaller parts ✓
- Parts are downloaded from different peers/seeders ✓
- Parts are recombined to form files ✓

Alternative concepts:
- Have the necessary software installed (1)
- Find/select the relevant torrent file (1)
- Download from a user that has shared the file/seeder/peer (1) (3)

3.1.5 (a) Switch ✓ (1)

3.1.5 (b) If the switch malfunctions, the entire network will not function. ✓
OR
Single point of failure (1) (1)

3.2 3.2.1 *Difference between a file syncing service and a backup service:*

Synchronisation is ensuring all devices have the latest copy of files. ✓
Backup is making an additional copy to be used in case of damage/loss. ✓ (2)

3.2.2 *Any TWO disadvantages of using cloud storage: ✓✓*

- You need internet access
- Data costs
- Security risk
- Company could go out of business leading to loss of data
- Cost for additional space on cloud storage if needed

Also accept other suitable examples. (2)

3.2.3 *Any TWO why optical fibre is the recommended choice of a communication medium to upload vast amounts of data to the cloud: ✓✓*

- Higher bandwidth/faster
- Does not degrade over long distances
- Immune against crosstalk
- Immune against EMI (2)

3.3 3.3.1 Locally ✓ (1)

3.3.2 *Any ONE example of data stored by a cookie:* ✓

- User information/preferences for the website
  - Location
  - Language
  - Email address
  - Unique ID
  - Password
- General information of previous visits
  - Date/time visited (1)

3.3.3 *Any TWO motivations for the use of apps:* ✓✓

- Transfers less data, leading to faster speeds
- Gives the user a more user-friendly control
- Gives the user more control on what they can do
- Allows the user to receive automatic notifications when content on the webpage is updated.
- Easy access
- Personalised
- More mobile
- No cookies being stored/created on your computer
- Allows offline use of content
- Improved security (2)

3.4 3.4.1 (a) People that group together online ✓ based on common interests and/or beliefs. (1)

(b) *Any ONE of the following Web 2.0 developments:* ✓

- Dynamic webpages were developed
- Users became contributors of content
- Websites have become interactive
- Led to the development of social networking (1)

3.4.2 (a) Multiple devices are connected to the internet. ✓ These devices can independently communicate with each other ✓ and make 'intelligent'/ rule-based logic decisions based on the input received.

Concepts:

- A range of devices are connected to the internet (1)
- These devices can independently communicate (1) (2)

3.4.2 (b) Any suitable example ✓✓

Example 1:
The alarm clock and the kettle are both connected to an app over the internet. When the alarm goes off, the kettle is switched on.

Example 2:
The app that manages the swimming pool is connected to a sensor in the pool as well as to other devices such as the pool pump. The sensor communicates the need for chemicals. The app then switches on the pump.

Concepts:

- Different IoT enabled devices are connected
- Communication/control between the devices (2)

TOTAL SECTION C: [30]

SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4

4.1 4.1.1 An ERD provides a visual representation ✓ of how the data/tables are linked in a relational database. ✓

Concepts:
- Mapping/visual representation (1) of a relationship between
- relational/linked tables or entities (1) (2)

4.1.2 (a) Entity ✓

(b) One ✓

ALSO ACCEPT:
Mandatory (due to the dual stripes)

(c) Relationship ✓

(d) Many ✓

ALSO ACCEPT:
Mandatory (due to the single stripe) (4)

4.1.3 *Requirement of a primary key:*

Cannot be null ✓/empty/needs to contain a value/compulsory field. (1)

4.1.4 (a) *Any TWO reasons why the table does not adhere to the rules of normalisation*: ✓✓

- No primary key
- There should be no repeating fields
- The "Number of songs" field can be derived/calculated (the field value should not be dependant on the value from another field)
- The "Number of songs" field will need to be updated as songs are added or removed from the table
- The songs must be placed in a separate linked table

Also accept any other valid explanations (2)

4.1.4 (b) *Any ONE reason why it is more suitable to save the playlist information in a database rather than in a text file*: ✓

- Easy to filter information
- Perform queries
- Easier to maintain the database (1)

4.2 4.2.1 The mark/grade must be an integer ✓
OR
The ID number must contain only digits (1) (1)

4.2.2 The range of marks is 0 to 150 ✓ (1)

4.2.3 Each learner must have an ID/grade/mark ✓ (1)

4.3 **Physical independence:**
A change in the physical level usually does not need change at the application program level. ✓
OR
The application does not need different code to take the location where the database is stored/ on which media the database is stored into account.

Logical independence:
You do not need to make changes in the application program if the structure of the database is changed such as when fields are added or deleted from the database. ✓
OR
When you change the design of a table/field in an existing database, the application will remain unaffected. (2)

4.4 4.4.1 To ensure the integrity of data. ✓
OR
To ensure that changes made are reflected/made in all related records/tables. (1) (1)

4.4.2 Rollback ✓ (1)

4.4.3 Record locking ✓ (1)

4.4.4 Many people work at the agency ✓ and it will be difficult to establish who made which changes without an audit trail. ✓
OR
The playlists contain copyright material of which the rights need to be protected, (1) thus access and changes to this need to be monitored. (1)

Any other valid example that includes the following **TWO concepts**:

- A motivation for tracking access/changes.
- Indicating that an audit trail tracks who accessed/made changes and when they were made. (2)

TOTAL SECTION D: 20

SECTION E: SOLUTION DEVELOPMENT

QUESTION 5

5.1 5.1.1 *Any ONE reason for the use of selection components rather than entry fields:* ✓

- Ensures validation
- Easier to choose than to type/faster capturing
- Eliminates the risk of capturing incorrect information/improves accuracy (1)

5.1.2 *Benefit of saving the applicants' details in a text file:*

The text file allows for permanent storage of information. ✓ (1)

5.1.3 *Any ONE reason why a bit button would be more suitable:* ✓

- Linked to a prewritten/provided event or code
- Has an icon that graphically indicates the purpose of the button (1)

5.2 5.2.1 Line 9 ✓ The square root of the number value must be assigned to a real variable. ✓ (2)

5.2.2 Line 13 ✓ The formula should be `iSquare := iNumber * iNumber` ✓
OR
`iSquare := SQR(iNumber) (1)` (2)

5.2.3 Line 15 ✓ Division by zero is undefined ✓ (2)

5.3 5.3.1 Correct ✓ (1)

5.3.2 Incorrect ✓ (1)

5.4 5.4.1 Private access ✓ (1)

5.4.2 A method such as the toString() is made accessible ✓ from other classes outside the object class. ✓ (2)

5.5

Text	Count	Index	Text [Index] = one of Y&$6@?	Index <= Length?	Count >=3 AND Length>=8?	Display
Y&$6@	0	1	True			
	1	2		True		
			True			
	2	3		True		
			True			
	3	4		True		
			True			
	4	5		True		
			True			
	5	6		False		
					False	
						INVALID
	✓	✓	✓	✓	✓	✓

(6)

TOTAL SECTION E: 20

SECTION F: INTEGRATED SCENARIO

QUESTION 6

6.1 6.1.1 Video on demand (VOD) is a content delivery platform/streaming service ✓ that allows viewers to choose when and what they watch. ✓

Concepts:

- Content delivery platform/streaming service
- The ability to choose when and what to watch (2)

6.1.2 *Any TWO aspects that will be addressed by a EULA:* ✓✓

- Copyright provisions
- Restrictions in terms of the number of installations/devices
- Set the conditions of your license agreement with a user
- Specifying what the videos may be used for
- Conditions for changing/termination of service

Also accept other valid answers. (2)

6.1.3 Geo-blocking works by establishing the user's Internet Protocol (IP) address. ✓ The IP address is used to determine geographical location of the user and then block content based on the location.✓

Concepts:

- Uses IP address to establish geographical location (1)
- The geographical location is used to apply restrictions (1) (2)

6.2 *Any TWO ergonomic guidelines to avoid potential health problems*: ✓✓

- Sit up straight with your back perpendicular to the ground.
- Your forearms should be at the same height as your mouse and keyboard.
- Your feet should be placed firmly on the ground.
- The back of your chair, height of your chair and height of the armrests of the chair should be adjusted to support your body in this position.
- Your monitor should be positioned at eye level and roughly 50 cm away from you.
- Your monitor should be tilted to reduce glare.
- You should take regular breaks while using the computer.
- Using ergonomic hardware
- Wearing anti-glare glasses/accessories
- Ensure correct level of lighting

Also accept other valid answers. (2)

6.3 6.3.1 *Any TWO motivations for streaming*: ✓✓

- Users want to start watching content immediately
- Copies of material will fill up user's storage
- Material is mostly copyright protected/makes piracy more difficult (2)

6.3.2 (a) Lossy compression ✓ (1)

(b) *Any TWO justifications for the use of lossy compression:* ✓✓

- Inconsequential data is lost/accuracy not essential because we are not working with numbers
- Less data needed to stream content
- Less storage needed to store content (by service provider) (2)

6.4 6.4.1 *Any ONE way in which secure connections can be checked:* ✓

- Lock symbol
- URL starts with https
- Checking digital certificate (1)

6.4.2 (a) Sensitive/private information is communicated over the internet during online payments,✓ encryption will ensure that unlawful access is not obtained to this information on a public network like the Internet. ✓

Concepts:
- Private information is sent over public network/internet
- Access to this information is prevented by encryption (2)

(b)
- Public key is obtained over the network from secure site ✓
- Session key / data is encrypted using the public key ✓ and sent to secure site.
- Session key/data is decrypted with the matching private key ✓ retained at secure site.

Concepts:
- Encryption using public key (1)
- Decryption using private key (1)
- Public key is sent / private key retained at secure site (1) (3)

6.4.3 *An explanation ✓✓ of any one example of a cyber technique used to obtain banking details of a user:*

NOTE: Both marks must be allocated to the explanation of a cyber technique (one mark per fact)

- Phishing –
  - Tricking someone to obtain sensitive information
  - by sending emails to users that look like official emails
- Spoofing –
  - Changing electronic communication's information
  - to make it seem as if it originated from a legitimate source
- Pharming –
  - Create an official-looking website
  - that requests sensitive information.
- Hacking –
  - Breaking through security of networks
  - to gain illegal access to personal information
- Man-in-the-middle attack –
  - Cyber criminals intercept communication
  - between users and legitimate banking websites
- Social engineering –
  - Manipulating (gain trust) someone
  - into giving out their personal information
- Malware (Keylogger, spyware) –
  - Malicious software used to
  - communicate personal/private information to a 3rd party (2)

6.5 6.5.1 (a) The ability to adapt the size/scale of the service to the changing requirements. ✓ (1)

(b) *TWO ways to use virtualisation*:
Combining the resources of many computers into one powerful service ✓
Sharing the resources of one powerful machine between many users ✓ (2)

6.5.2 (a) *Any TWO facts to motivate ✓✓ a distributed model:*

NOTE: Both marks must be allocated to the motivation of a distributed model (one mark per fact)

- Duplication –
  - All servers will have to be able to handle any user
  - because users can log on from anywhere
- Partitioning –
  - Users will be mostly distributed in certain geographical areas
  - data is accessible locally based on the need of users in a geographical area

NOTE: The motivation must fit with the concept of duplication having all the data, while partitioning only stores data needed by the specific server. (2)

(b) Regular synchronisation of databases. ✓

OR suitable description of synchronisation (1)

6.6 6.6.1 Artificial intelligence is computer software/systems ✓ that simulates human intelligence. ✓

Concepts:
- Intelligence based in computer systems/technologies (1)
- Simulates human intelligence (1) (2)

6.6.2 *Any ONE advantage of using a chatbot:* ✓

- Facilitate seamless live communication
- Make customer service available 24/7
- Improve response time
- Saving on personnel costs
- Automates tedious time-consuming tasks
- Get constant improvement over time with machine learning (1)

6.6.3 *Any TWO motivations for using a real person:* ✓✓

- Can handle a wider variety of questions/answers
- Provides employment to people
- Unwillingness of people to use service because they know it is a machine
- Negative perceptions of AI
- Machines are not equipped to handle context/emotions (2)

6.7 6.7.1 *Any TWO steps ✓✓ of data analytics with examples ✓✓*

- Cleaning the data (1)
  - by removing unwanted/redundant data like user preferences that are now outdated. (1)
- Analysing data (1)
  - to identify which age groups makes more use of VOD services and what their preferences are. (1)
- Visualisation/Modelling (1)
  - where the popularity of VOD services can be shown in terms of time of day/night being watched/categories of VOD services in terms of a graph. (1)

NOTE: Other examples related to the scenario can also be used. (4)

6.7.2 *Any TWO challenges with big data: ✓✓*

- Extreme processing power needed to process very large amounts of data
- Large amount of storage required for large amounts of data
- Algorithms must be able to process variety of data
- Mechanisms to collect / capture data from variety of sources
- Time consuming due to the large amount of data to work with

OR any other applicable challenge (2)

6.7.3 *Any TWO negative impacts on users to provide content to the user which specifically matches their viewing history: ✓✓*

- User's field of interest is artificially limited
- Negative or incorrect perceptions might be continuously re-affirmed
- Process can be used to manipulate user for other intentions
- Information from analytics can be sold to 3rd parties
- Can expose private information to others

OR any other suitable example of negative impact (2)

TOTAL SECTION F: 40
GRAND TOTAL: 150