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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.

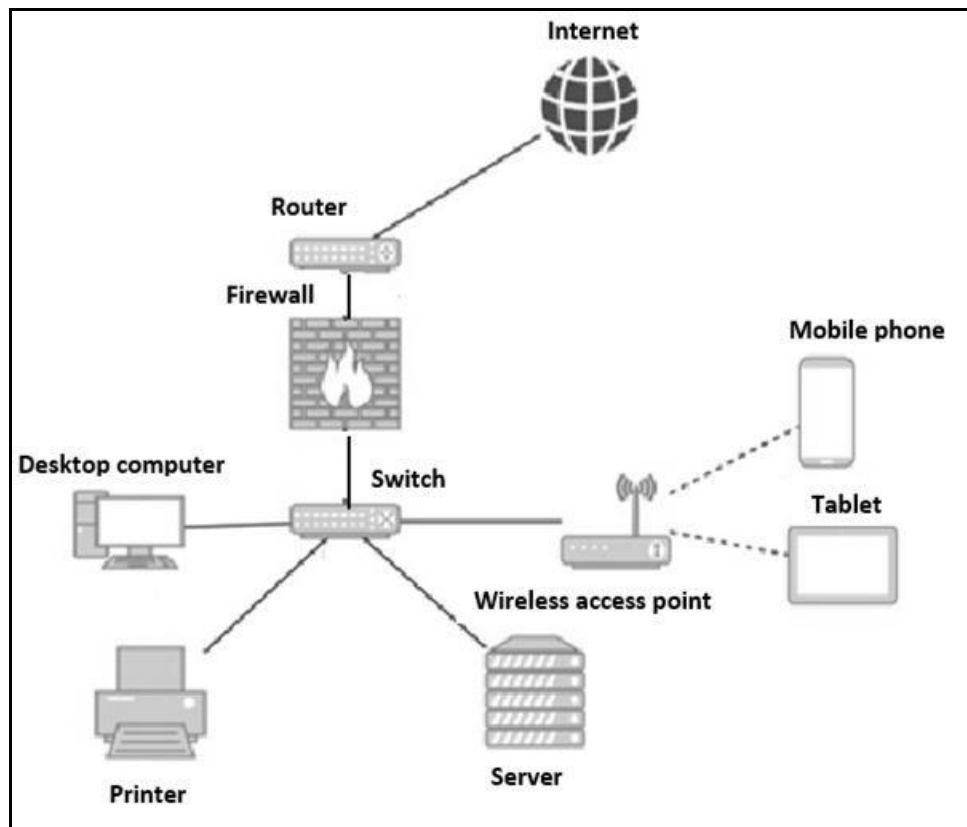


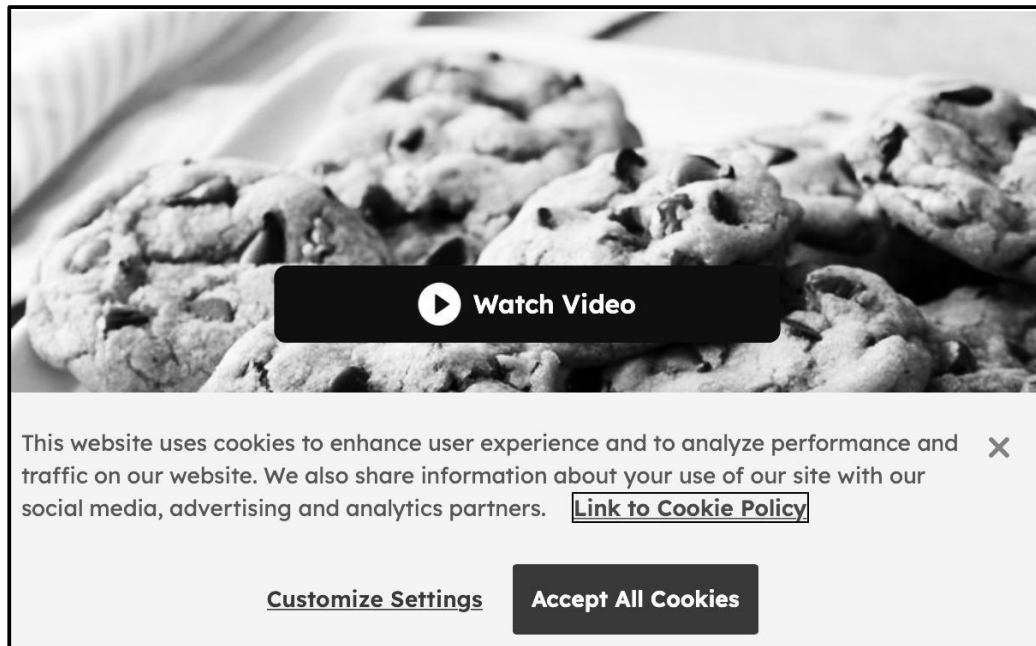
FIGURE 1

- 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).

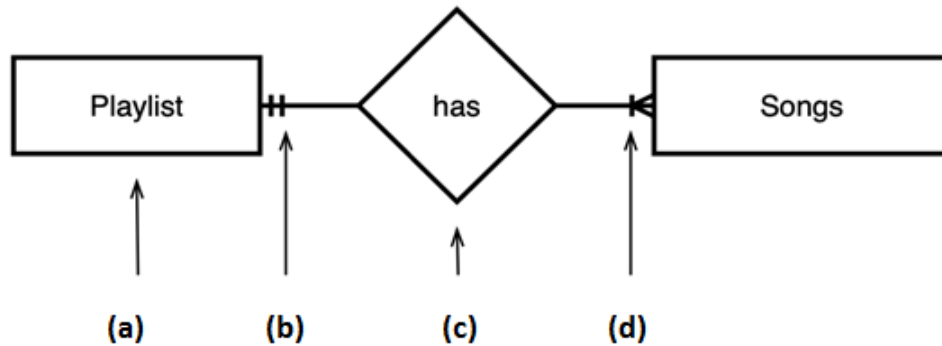
(a) What is the *IoT*? (2)

(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.

BEST SONG WRITER COMPETITION

Name

Surname

Gender
☐ Male
☐ Female

Genre of music

Date of birth

June 2007						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

- 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)

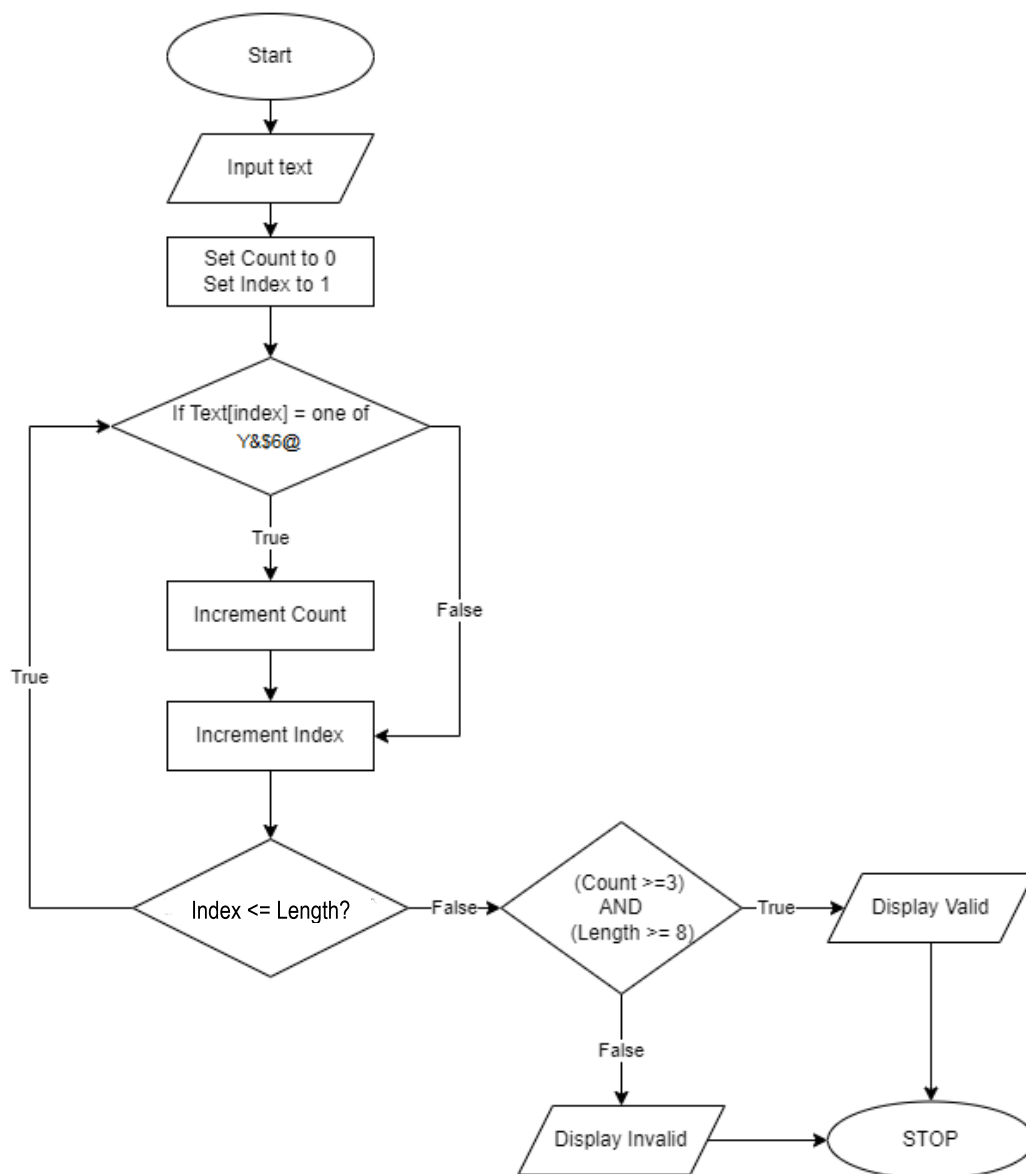
5.4 Classes and objects are key aspects in object-orientated programming.

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). (2)
- (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. (1)
- (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. (2)
- (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). (2)
- 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