education

Department:
Education
PROVINCE OF KWAZULU-NATAL

JUNE EXAMINATION 2017

INFORMATION TECHNOLOGY P2
08 JUNE 2017

TIME: 3 HOURS

MARKS: 150

This paper consists of 16 pages.

INSTRUCTIONS:

READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING THE QUESTIONS.

1. This paper consists of **SIX** questions:

SECTION A:	Question 1	Multiple-choice questions	(15)
SECTION B:	Question 2	Hardware and Software	(25)
SECTION C:	Question 3	Communication and Network Technologies	(25)
SECTION D:	Question 4	Data and Information Management	(25)
SECTION E	Question 5	Programming and Software Development	(26)
SECTION F:	Question 6	Integrated Scenario	(34)
			[150]

2. Answer **ALL** the questions.
3. Read **ALL** the questions carefully before answering.
4. Number the **answers correctly according to the numbering system used** in this question paper.
5. Write **neatly** and legibly.
6. Write on **both sides** of the answer booklet.

SECTION A.

Question 1. MULTIPLE CHOICE QUESTIONS.

Various possible options are provided as answers to the following questions. Choose the MOST CORRECT answer and write only the letter (A - D) - CLEARLY - next to the question number (1.1 - 1.10) in the ANSWER BOOK. You will be given a bonus mark if you write each answer down using an uppercase letter with a full stop after it. Make sure that your letters are not written ambiguously

Example : 1.11 D.

1.1 The acronym for the connection on the motherboard between the CPU and the RAM is ... .

(A) USB.
(B) FSB.
(C) ZIF.
(D) NIC. [1]

1.2 Social engineering refers to

(A) Updating and configuring the social media pages on a network.
(B) The creation and maintenance of social websites such as Facebook.
(C) The act of fraudulently convincing a person to reveal personal details for the purpose of illegal activities
(D) The updating of Virus software in order to deal with scams. [1]

1.3 The design of a database affects how easily it can be accessed or manipulated. The type of problem that results in a bookshop needing to add the details of at least one book product so that the publisher's details may be entered is known as.....

(A) An insert anomaly
(B) An update anomaly
(C) Data redundancy
(D) Data independence [1]

1.4 Which one of the following has the largest storage capacity?

(A) 200 KB folder
(B) 32 GB flash disk
(C) 2 TB hard drive
(D) 720 MB DVD [1]

1.5 Interpreters *differ* from Compilers in the sense that they.....

(A) Translate high level language into the machine code that the computer will understand.
(B) Are easier to program with than assembly languages.
(C) Do not generate executable files
(D) Recognise reserved words that are used within the programming language. [1]

1.6 Which ONE of the following statements will calculate the bonus of a staff member correctly, if all staff members get a R100 bonus and a further 2% of their salary for each year of service?

(A) Bonus = (100 + YearsOfService) * Salary * 0.02
(B) Bonus = (100 + YearsOfService) * Salary * 0.02
(C) Bonus = YearsOfService * Salary + 100 * 0.02
(D) Bonus = 100 + YearsOfService * Salary * 0.02 [1]

1.7 The operating system *process* that involves sending documents to be printed to a buffer on the disk drive instead of directly to the printer is known as

(A) Spoofing
(B) Buffering
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(D) Formatting [1]

1.8 Which ONE of the following logic statements can be used to do a search for white cars owned by a person with the surname Mkhize or Bahvuma?

(A) (CarColour = white OR Surname = Mkhize) OR Surname = Bahvuma
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(D) CarColour = white AND (Surname = Mkhize OR Surname = Bahvuma) [1]

1.9 The *scope* of a variable specifies ....

(A) The area of the program in which the variable can be used
(B) The possible values that can be stored in the variable
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1.10 The correct conversion of $F2_{16}$ to a decimal number is ...

(A) 3 842
(B) 18
(C) 242
(D) 304 [1]

1.2 Give ONE word/term for each of the following descriptions. Write only the word/term next to the question number (1.2.1–1.2.5) in the ANSWER BOOK.

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1.2.2 Initiatives to design, use and dispose of technology in an environmentally friendly way (1)

1.2.3 The protocol used to transfer large files between remote computers that have internet connection (1)

1.2.4 Increasing the speed of the system bus/clock, hence increasing the speed of all components of a computer system to enhance the performance (1)

1.2.5 A series of steps that need to be followed when designing a database to ensure that no data redundancy occurs (1)

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SECTION B - SYSTEM TECHNOLOGIES.

SCENARIO

Five schools in your area have formed a committee to oversee the upgrading of their IT departments in order to speed up service delivery to educators, parents and learners in the community. The IT department in each school will be under-going numerous changes.

Question 2 - Hardware and Software.

2.1. The current computers that are over 5 years old need to be replaced. There are a number of factors which combine to determine the overall performance of a computer.

2.1.1 Give **TWO** aspects of the CPU that have a direct influence over the system performance. (2)

2.1.2 Cache memory also affects the computers performance.

(a) What is cache memory? (2)

(b) What is the purpose of caching? (1)

(c) Web cache speeds up access to the internet. This can be particularly successful when applied to the idea of allowing the users of the LAN to use the internet.
Briefly explain how Web-caching would facilitate the Internet users within the LAN. (2) [7]

2.1.3 'SSD's are increasingly used nowadays'

(a) Briefly explain the purpose of having both SSD and a HDD in your computer. (2)

(b) What benefits does a SSD provide over a mechanical hard drive? (2) [4]

2.2 One school has received a donation of an entry-level desktop computer with a small hard-drive and an integrated graphics controller. It is to be used for editing video footage of the school play.

2.2.1 Explain why a small hard drive will be a problem in terms of using it for computing when editing videos. (1)

The computer has an 'integrated graphics controller'. Explain what this is, and motivate whether or not it would be suitable for video

2.2.2 editing. (2) [3]

2.3 The process of *booting up* a computer involves a number of steps.

2.3.1 What does the acronym BIOS stand for? (1)

2.3.2 What role does the BIOS play in the boot up process of a computer? (3)

[4]

2.4 The operating system of a computer has many functions, including process management and memory management

2.4.1 Briefly explain how the operating system manages the processor. (2)

2.4.2 The implementation of Virtual Memory is another task for the operating system.

(a) When will the operating system use virtual memory? (1)

(b) Does the availability of virtual memory mean that adding more RAM to the computer system to improve the performance is no longer necessary? Motivate your answer. (2) [5]

2.5 One of the schools was advised to update the antivirus software on the computer.

Why is it necessary to always keep the antivirus software up to date? (2) [2]

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SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

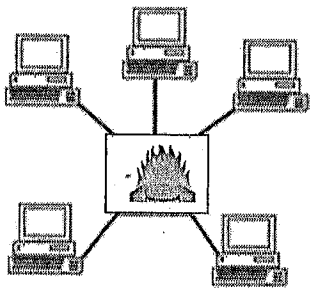
QUESTION 3.

3.1 Each of the schools rely on connectivity which is one of the key aspects of modern computing.

UTP cable will be used for the network in each school.
Name and discuss TWO weaknesses that can occur when making use of UTP cables. [4]

3.2 Computers are laid out in a network in what is known as a *topology.*

Examine the diagram below.



3.2.1 Name the topology shown in diagram above. (1)

3.2.2 Briefly describe **TWO** advantage of the given topology. (2)

3.2.3 Explain why a LAN would require both a router and a switch by referring to the function of each device. (2) [5]

3.3 Once a network has been set up, a decision must be taken regarding how the network will connect to the Internet.

One such method is through a permanent connection such as ADSL.

3.3.1 What is an ADSL connection? Do NOT merely expand the acronym. (2)

3.3.2 Briefly describe a way in which a workstation in the network would be able to make use of the ADSL line which links the network to the Internet. (2)

3.3.3 You have brought your laptop to school but the network administrator tells you that you may not plug existing network cables into your laptop in order to use the Internet.

Briefly explain **TWO** ways in which you would be able to get Internet connectivity for your laptop computer. (2) [6]

3.4 These academic institutions will run **Client-Server** networks.

3.4.1 Give **THREE** reasons why client-server networks are necessary in these institutions. (3)

3.4.2 Name another network configuration that could be used. (1) [4]

3.5 Online media stores, like iTunes and Amazon, that provide the facility of media repositories, will be used to play music in the school hall during the events hosted at the school.

3.5.1 Explain what a *media repository* is in this context. (2)

3.5.2 Why is it acceptable to use this type of repository for music files, but not for video files? (2) [4]

3.6 The schools will have a website where parents can pay school fees.

3.6.1 The site will have to get a digital certificate. Explain what a digital certificate is. (1)

3.6.2 Why would it be necessary to have a digital certificate for their site? (1) [2]

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SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4.

One of the favourite, most played sport between the five schools is netball. A database will be used to store the details of the participants and to keep a record of the games played.

The following tables have been designed for the database:

tblPlayers		
Key	**FieldName**	**DataType**
🔑	PlayerID	Text
	PName	Text
	PSurname	Text
	TeamID	Text
	Captain	Yes/No

tblTeam		
Key	**FieldName**	**DataType**
🔑	TeamID	Text
	TeamName	Text
	SchoolName	Text

tblGamesPlayed			
Key	**FieldName**	**DataType**	**Description**
🔑	GameNumber	Number	A unique number allocated for each game played in sequence starting from 1
	TeamID1	Text	Team 1 ID
	TeamID2	Text	Team 2 ID
	StartTime	Date/Time	The starting time of the game
	DateOfPlay	Date/Time	The scheduled date for the game
	Winner	Text	TeamID of the winning team

Example of data from the **tblPlayers** table:

PlayerID	PName	PSurname	TeamID	Captain
X782	Nosipho	Mkhize	T101	Yes
D901	Joanne	Fredriks	T104	No

Example of data from the **tblTeam** table:

TeamID	TeamName	SchoolName
T101	Dolphins	SchoolA
T102	Blue Bells	SchoolB
T103	Bright Daisies	SchoolA
T104	Fitness Freaks	SchoolC

Example of data from the **tblGamesPlayed** table:

GameNumber	TeamID1	TeamID2	StartTime	DateofPlay	Winner
1	T102	T104	14:45	05/06/2017	T104
2	T103	T101	15:45	05/06/2017	T101
3	T102	T101	14:00	06/06/2017	T101

4.1.1 What is the term given to the **TeamID** field in the **tblPlayers** table? (1)

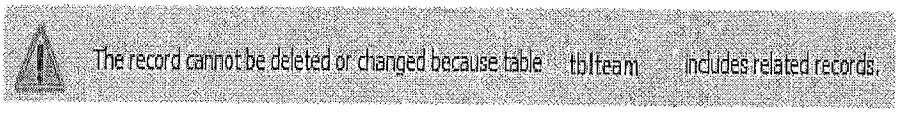
4.1.2 What is the term given to the **PlayersID** field in the **tblPlayers** table? (1)

4.1.3 How many games will each Team be able to play per day based on the construction of the database? Choose the answer from the options (A–C) provided below.

A One game per day
B Two games per day
C Any number of games per day (1)

4.1.4

The following message is displayed when attempting to delete the Team with with TeamID T101 from the **tblTeam** table:



(a) Explain why this message is displayed? (2)

(b) State a possible solution to delete a record from the **tblTeams** table successfully. (2)

[7]

4.2 Correctly designed databases function effectively. Data integrity refers to maintaining the *accuracy* and *consistency* of the data that has been stored.

4.2.1 Briefly distinguish between *physical* integrity and *logical* integrity of the data. (2)

4.2.2 An aspect of logical integrity of a database is *referential integrity.* Briefly explain what this is. (1) [3]

4.3 "The DBMS assists the DBA in updating, controlling and maintaining the database."

4.3.1 What is the DBMS? (1)

4.3.2 What is the DBA? (1)

4.3.3 Briefly explain how the DBMS deals with a 'commit' instruction. (1)

4.3.4 *Data Independence* is a concept that must be implemented by the DBMS. Briefly explain what data independence is, giving **ONE** advantage of the concept. (3) [6]

4.4 **Using the tables from Question 4.1., write the SQL statements that will achieve the following:**

4.4.1 Display the **TeamName** and **SchoolName** of all Teams in the database. They must be sorted alphabetically in descending order of SchoolName. (3)

4.4.2 Display the PlayerName, PlayerSurname and TeamName of all players that play for the team with TeamID T101 (3)

4.4.3 Write a query that will display the GameNumber, winning TeamName and the Captain's name. (3) [9]

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SECTION E: PROGRAMMING AND SOFTWARE DEVELOPMENT

QUESTION 5: ALGORITHMS AND PLANNING

5.1 A software development team sponsors the writing of Software to assist the schools to run efficiently. It is important to understand the terms that are used within an OOP environment in order to produce good, robust software

5.1.1 Choose a description from COLUMN B that most correctly matches a term in COLUMN A.

COLUMN A	COLUMN B
5.1.1.1. parameter	A an object keeping it's attributes/methods private
5.1.1.2. inheritance	B the instantiation of a class
5.1.1.3. Object	C is used in a subroutine to refer to one of the pieces of data provided as input to the subroutine
5.1.1.4. Access modifier	D a **subclass** of its parent class or super class providing a mechanism for code reuse and to allow independent extensions of the original software.
5.1.1.5. Encapsulation	E specifies whether a field (attribute) or method is private or public

(5)

Constructors are special methods in a class. What is the purpose of a

5.1.2 parametrised constructor. (1)

5.1.3 Give **TWO** advantages of programming in a modular way. (2)

5.1.4 Name **ONE** significant difference between an *accessor* and a *mutator* method. (2) [10]

5.2. A program is being developed to generate ticket numbers for school concerts, sporting events etc.

Each ticket number is made up of 4 digits and a control digit. The control digit is determined as follows:

- The 4 digits of the ticket number are multiplied by descending numbers, starting at 7.
- Each answer is then added.
- The control digit is then the remainder after dividing the total by 5

Example:

Ticket number: 5621
Control digit calculation: (5*6)+(6*5)*(2*4)+(1*3) = 71
71 modulus 5 = 1
Five-digit ticket number: 56211

Write pseudocode to enter a 4-digit number. Generate and add the control digit to the 4-digit number. Display the ticket number. (8) [8]

5.3 Learners are allowed to pay their school fees in full during the first 10 months(January to October) of the year before warning letters are issued to them. The number of learners that paid their school fees in full for each of the months is stored in an array called SchoolFees as indicated below:

SchoolFees:

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Value	128	240	55	72	66	108	85	88	60	212

The software developer has designed the following algorithm:

```
Line
1       Total ← 0
2       Counter ← 5
3       Average ← 0
4       Loop until Counter > 10
5           Counter ← Counter + 1
6           Total ← Total + SchoolFees[Counter]
7       End Loop
8       Average ← Total/Counter
9       Display Average
```

5.3.1 Suggest a suitable data type for variable

(a) **Average** (1)

(b) **Counter** (1)

5.3.2 When the program is executed, a run-time error occurs.

(a) Explain what a run-time error is in general. (1)

(b) The run-time error indicates that line 5 of the given algorithm caused the error. Rewrite line 4 of the algorithm in order to correct the error. (2)

5.3.3 Assume that the error in line 4 has been corrected. When the program is executed, an incorrect value for the variable Average is displayed.

(a) What type of programming error is generally associated with incorrect output? (1)

(b) Rewrite a single line from the algorithm above which will fix the error and output the correct average. Also indicate the line number of the statement that you are rewriting in your answer. (2) [8]

SECTION E: INTEGRATED SCENARIO.

QUESTION 6.

The administrative building (Secretary's Office) will be the central hub from which all school activities will be managed and monitored.

6.1 The school secretary says that she suspects that unauthorised software is running on her computer since she notices suspicious activities at times.
State two types of programs that can be used to retrieve data from a computer without permission or knowledge of the user. (2) [2]

6.2 When purchasing tickets for school events online, users need to provide personal information in order to create a user account.

(a) State two precautions to prevent identity theft, which can occur during this process. (2)

(b) Suggest two ways to ensure that a password for a user account is strong. (2)

(c) State two ways the learner will know that the school website is a secure website. (2) [6]

6.3 The programming team suggests the use of Software as a Service (SAAS) and the possibility of using a web-based office suite such as Google Docs.

(a) State two advantages of using SAAS. (2)

(b) Briefly explain the difference between cloud backup services and cloud syncing services. (2) [4]

6.4 In addition, the schools' will provide Wi-Fi access to learners and educators.

6.4.1 Name the medium used to transfer data in a Wi-Fi network. (1)

6.4.2 Wireless access points will be installed at various places on the school campus.

(a) What is the function of a Wi-Fi access point? (1)

(b) Give two reasons why multiple access points will be needed. (2)

6.4.3 Learners will use their mobile devices (tablets) to access the Internet

at school.

(a) What does it mean when one describes a mobile device as having '*always on*' functionality? (2)

(b) Suggest two ways that can be used in order to improve the battery life of a mobile device when in use. (2)

6.4.4 Which cellular technology could also be used to access the Internet? (1) [9]

6.5 Often learner's iPads and tablets become infected with *malware.*

6.5.1 What is *malware*? (1)

6.5.2 State two symptoms that may indicate that a computer or iPad has been infected by a virus. (2)

6.5.3 If a website interfaces with the school's database, it is possible that it may be subjected to an SQL injection attack. Briefly explain what an *SQL injection* is. (2) [5]

6.6 Documentaries and movies containing educational content are useful to watch and can improve understanding of sections being taught. Learners are told that they can download useful material using BitTorrent.

6.6.1 What is *BitTorrent*? (2)

6.6.2 Is it legal for the learners to download movies and documentaries using BitTorrent? Justify your answer. (2) [4]

6.7 The majority of teachers are now using e-learning to enhance their teaching.

6.7.1 State two ways in which e-learning may be beneficial to the learner. (2)

6.7.2 Lesson videos are made to download or stream. What is the difference between downloading and streaming. (2) [4]

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1.2.2 Initiatives to design, use and dispose of technology in an environmentally friendly way. Green Computing (1)

1.2.3 The protocol used to transfer large files between remote computers that have internet connection. Internet Protocol/ IP (1)

1.2.4 Increasing the speed of the system bus/clock, hence increasing the speed of all components of a computer system to enhance the performance. Overclocking (1)

1.2.5 A series of steps that need to be followed when designing a database to ensure that no data redundancy occurs. Normalisation (1)

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SCENARIO

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2.1.1 Give **TWO** aspects of the CPU that have a direct influence over the system performance. (2)
The speed in GHz – higher is better✓
The number of cores that the CPU has.✓

2.1.2 Cache memory also affects the computers performance.

(a) What is cache memory? (2)
Cache memory is special high speed memory ✓ close to or on the CPU ✓

(b) What is the purpose of caching? (1)
To prevent a slower medium from slowing down the performance of a faster medium✓
OR
The speed of the CPU is higher than most motherboards and RAM. So extensive use is made of cache to keep the CPU running at optimum capacity. ✓

(c) Web cache speeds up access to the internet. This can be particularly successful when applied to the idea of allowing the users of the LAN to use the internet.
Briefly explain how Web-caching would facilitate the Internet users within the LAN. (2) [7]
Internet Proxy server✓ could store recently visited sites from all users✓ on its hard-drive in order to speed up general access.

2.1.3 'SSD's are increasingly used nowadays'

(a) Briefly explain the purpose of having both SSD and a HDD in your computer. (2)

Set up the SSD as the system/primary drive on which the operating system is installed for faster boot up and system performance. ✓
Set up the HDD as a secondary drive which contains all your data files. ✓

(b) What benefits does a SSD provide over a mechanical hard drive? (2) [4]

There is no physical moving parts when writing or reading on an SSD✓
There is no time spent to move to the position where file is saved It can access it immediately. ✓

2.2 One school has received a donation of an entry-level desktop computer with a small hard-drive and an integrated graphics controller. It is to be used for editing video footage of the school play.

2.2.1 Explain why a small hard drive will be a problem in terms of its use in the computing required for the editing of videos. (1)
Video files are large and require a hard drive with a large capacity for storage and editing files. ✓

2.2.2 The computer has an 'integrated graphics controller'. Explain what this is, and motivate whether or not it would be suitable for the video editing. (2) [3]
Built onto the computer's motherboard and not a separate card ✓
- usually a dedicated graphics card would be needed if intensive graphics work or gaming is used✓

2.3 The process of *booting up* a computer involves a number of steps.

2.3.1 What does the acronym BIOS stand for? (1)
Basic Input Output System✓

2.3.2 What role does the BIOS play in the boot up process of a computer? (3)
It is the lowest level of software✓ which checks hardware✓, and provides the user with a set of options to configure the computer✓ [4]

2.4 The operating system of a computer has many functions, including process management and memory management

2.4.1 Briefly explain how the operating system manages the processor. (2)
Can divide threads or processes between multiple cores✓
can control the CPU's ability to perform small parts of each task✓

or (multi-processing✓ multi-tasking✓)

2.4.2 The implementation of Virtual Memory is another task for the operating system.

(a) When will the operating system use virtual memory? (1)
Programs too large to run from available RAM ✓
Or
Too many applications open✓

(b) Does the availability of virtual memory mean that adding more RAM to the computer system to improve the performance is no longer necessary? Motivate your answer. (2) [5]
No,✓Access to virtual memory is slower than access✓ to RAM and hence slows down the PC's performance.

2.5 One of the schools was advised to update the antivirus software on the computer.

Why is it necessary to always keep the antivirus software up to date? (2) [2]

- To ensure that the latest viruses will not attack the system ✓
- New features of the virus are added ✓
- Update the virus database

(any 2)

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SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES

QUESTION 3.

3.1 Each of the schools rely on connectivity which is one of the key aspects of modern computing.

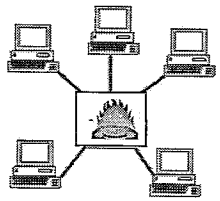
UTP cable will be used for the network in each school.
Name and discuss TWO weaknesses that can occur when making use of UTP cables. [4]

- Attenuation: susceptible to attenuation, cable length cannot be longer than 100m.
- Eavesdropping: sensitive to eavesdropping although the twisting does help reduce the sensitivity.
- Crosstalk: magnetic fields of two wires that are close to one another can interfere with transmission and can result in loss or corruption of data.
- EMI: sensitive to EMI and power surges although twisting does help to reduce the sensitivity.

(List TWO weaknesses ✓✓, explain each weakness ✓✓)

3.2 Computers are laid out in a network in what is known as a *topology.*

Examine the diagram below.



3.2.1 Name the topology shown in diagram above. (1)
Star topology✓

3.2.2 Briefly describe **TWO** advantage of the given topology. (2)
Easy to troubleshoot✓
If one PC in the network requires repairs, the entire network is not affected. ✓
Easy to add more PC's to the network✓, (any two) [5]

3.2.3 Explain why a LAN would require both a router and a switch by referring to the function of each device. (2)
A router makes communication possible between different networks/Allows access to the Internet. ✓
A switch makes communication possible between devices on a network ✓

3.3 Once a network has been set up, a decision must be taken regarding how the network will connect to the Internet.

One such method is through a permanent connection such as ADSL.

3.3.1 What is an ADSL connection? Do NOT merely expand the acronym. (2)
Digital, high speed✓ broadband✓ line

3.3.2 Briefly describe a way in which a workstation in the network would be able to make use of the ADSL line which links the network to the Internet. (2)
Would connect the Internet (proxy server) to a switch ✓ which would manage and distribute the Internet facility ✓

3.3.3 You have brought your laptop to school but the network administrator tells you that you may not plug existing network cables into your laptop in order to use the Internet.

Briefly explain **TWO** ways in which you would be able to get Internet connectivity for your laptop computer. (2) [6]
Use Wi-Fi signals if they are available at the school✓
Use your cell phone (create a hotspot) and use the cellular 3G/4G signals✓
(Any sensible answer)

3.4 These academic institutions will run **Client-Server** networks.

3.4.1 Give **THREE** reasons why client-server networks are necessary in these institutions. (3)
Security is necessary✓
Usually the network is large and Client-Server is better for this✓
When new software is installed, it's easier to deploy it centrally✓
Backups are more easily done (centrally)✓
(ANY Three sensible points)

3.4.2 Name another network configuration that could be used. (1) [4]
Peer-to-peer✓

3.5 Online media stores, like iTunes and Amazon, that provide the

facility of media repositories, will be used to play music in the school hall during the events hosted at the school.

3.5.1 Explain what a *media repository* is in this context. (2)
It is storage space in the cloud ✓ to which you are given access once you purchased the media. ✓

3.5.2 Why is it acceptable to use this type of repository for music files, but not for video files? (2) [4]
High bandwidth✓and a lot of data are required to watch movies online✓

3.6 The schools will have a website where parents can pay school fees.

3.6.1 The school will have to get a digital certificate. Explain what a digital certificate is. (1)
A digital certificate authenticates the Web credentials of the sender and lets the recipient of an encrypted message know that the data is from a trusted source✓ (or a sender who claims to be one).

3.6.2 Why would it be necessary to have a digital certificate for their site? (1) [2]
A digital certificate will be accessible to the browser to verify✓ the website of the school.

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SECTION D: DATA AND INFORMATION MANAGEMENT

QUESTION 4.

One of the favourite, most played sport between the five schools is netball. A database will be used to store the details of the participants and to keep a record of the games played.

The following tables have been designed for the database:

tblPlayers		
Key	**FieldName**	**DataType**
PK	PlayerID	Text
	PName	Text
	PSurname	Text
	TeamID	Text
	Captain	Yes/No

tblTeam		
Key	**FieldName**	**DataType**
PK	TeamID	Text
	TeamName	Text
	SchoolName	Text

tblGamesPlayed			
Key	**FieldName**	**DataType**	**Description**
PK	GameNumber	Number	A unique number allocated for each game played in sequence starting from 1
	TeamID1	Text	Team 1 ID
	TeamID2	Text	Team 2 ID
	StartTime	Date/Time	The starting time of the game
	DateOfPlay	Date/Time	The scheduled date for the game
	Winner	Text	TeamID of the winning team

Example of data from the **tblPlayers** table:

PlayerID	PName	PSurname	TeamID	Captain
X782	Nosipho	Mkhize	T101	Yes
D901	Joanne	Fredriks	T104	No

Example of data from the **tblTeam** table:

TeamID	TeamName	SchoolName
T101	Dolphins	SchoolA
T102	Blue Bells	SchoolB
T103	Bright Daisies	SchoolA
T104	Fitness Freaks	SchoolC

Example of data from the **tblGamesPlayed** table:

GameNumber	TeamID1	TeamID2	StartTime	DateofPlay	Winner
1	T102	T104	14:45	05/06/2017	T104
2	T103	T101	15:45	05/06/2017	T101
3	T102	T101	14:00	06/06/2017	T101

4.1.1 What is the term given to the **TeamID** field in the **tblPlayers** table? (1)
Foreign key✓

4.1.2 What is the term given to the **PlayersID** field in the **tblPlayers** table? (1)
Primary key✓

4.1.3 How many games will each Team be able to play per day based on the construction of the database? Choose the answer from the options (A–C) provided below.

A One game per day
B Two games per day
C Any number of games per day
C✓ (1)

4.1.4 The following message is displayed when attempting to delete the Team with TeamID T101 from the **tblteam** table:

(a) Explain why this message is displayed? (2)
tblTeam is related to tblPlayers and referential integrity ✓is enforced and one or more players are assigned to TeamID T101✓

(b) State a possible solution to delete a record from the **tblTeams** table successfully. (2) [7]
Assign all players in tblPlayers that belong to Team with TeamID T101✓ to another team✓ then you can perform the delete.

4.2 Correctly designed databases function effectively. Data integrity refers to maintaining the *accuracy* and *consistency* of the data that has been stored.

4.2.1 Briefly distinguish between *physical* integrity and *logical* integrity of the data. (2)
Physical – overcoming practical issues such as power failure, natural disasters etc✓
Logical – correctness of data and the data making sense in a particular context ✓

4.2.2 An aspect of logical integrity of a database is *referential integrity.* (1) [3]
Briefly explain what this is.
Ensuring that the data involved in a one to many relationship remains correct ✓
Or
can't remove a record if the record on the other side of the relationship requires it✓

4.3 "The DBMS(Database Management System) assists the DBA (Database Administrator) in updating, controlling and maintaining the database."

4.3.1 What is the DBMS? (1)
Software that handles the manipulation and interfacing with the database✓

4.3.2 What is the DBA?
A person or team that designs, controls and secures the database.✓ (1)

[6]

4.3.3 Briefly explain how the DBMS deals with a 'commit' instruction. (1)
It saves whatever changes have been made back to storage✓

4.3.4 *Data Independence* is a concept that must be implemented by the DBMS. Briefly explain what data independence is, giving **ONE** advantage of the concept. (3)
The separation between the software✓ that uses the db applications and the actual datastructure being managed by the DBMS.✓
Advantage : don't need different code to deal with different media that may use the database.
OR
When you change the database (e.g. add another table) the existing applications can still run. ✓
OR
Multiple applications can use the same data

4.4 **Using the tables from Question 4.1., write the SQL statements that will achieve the following:**

4.4.1 Display the **TeamName** and **SchoolName** of all Teams in the database. They must be sorted alphabetically in descending order of SchoolName. (3)
SELECT TeamName, SchoolName ✓FROM tblTeam ✓ORDER BY SchoolName DESC✓

4.4.2 Display the PlayerName, PlayerSurname and TeamName of all players that play for the team with TeamID T101 (3)
SELECT PlayerName, PlayerSurname, TeamName ✓ FROM tblPlayers, tblTeam ✓ WHERE tblPlayers.TeamID = 'T101' AND tblTeam.TeamID = 'T101'✓

4.4.3 Write a query that will display the GameNumber, winning TeamName and the Captain's name. (3) [9]
SELECT GameNumber, TeamName, PlayerName FROM tblGamesPlayed, tblTeam,tblPlayers ✓WHERE tblGamesPlayed.Winner = tblTeam.TeamID AND

tblGamesPlayed.Winner = tblPlayers.TeamID ✓AND
tblPlayers.Captain = yes✓

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SECTION E: PROGRAMMING AND SOFTWARE DEVELOPMENT

QUESTION 5: ALGORITHMS AND PLANNING

5.1 A software development team sponsors the writing of Software to assist the schools to run efficiently. It is important to understand the terms that are used within an OOP environment in order to produce good, robust software

5.1.1 Choose a description from COLUMN B that most correctly matches a term in COLUMN A.

COLUMN A	COLUMN B
5.1.1.1. parameter	A an object keeping it's attributes/methods private
5.1.1.2. inheritance	B the instantiation of a class
5.1.1.3. Object	C is used in a subroutine to refer to one of the pieces of data provided as input to the subroutine
5.1.1.4. Access modifier	D a **subclass** of its parent class or super class providing a mechanism for code reuse and to allow independent extensions of the original software.
5.1.1.5. Encapsulation	E specifies whether a field (attribute) or method is private or public

(5)

5.1.2 Constructors are special methods in a class. What is the purpose of a parametrised constructor. (1)
To assign values to the private attributes. ✓

5.1.3 Give **TWO** advantage of programming in a modular way. (2)
Easier to troubleshoot
Multiple programmers can be used
Easier to maintain/make changes to the program (ANY TWO) ✓✓

5.1.4 Name **ONE** significant difference between an *accessor* and a *mutator* method. (2)
Accessor methods return information OR
Mutator methods make changes to the attributes✓

[10]

5.2. A program is being developed to generate ticket numbers for school concerts, sporting events etc.

Each ticket number is made up of 4 digits and a control digit. The control digit is determined as follows:

- The 4 digits of the ticket number are multiplied by descending numbers, starting at 7.
- Each answer is then added.
- The control digit is then the remainder after dividing the total by 5

Example:
Ticket number: 5621
Control digit calculation: (5*6)+(6*5)*(2*4)+(1*3) = 71
71 modulus 5 = 1
Five-digit ticket number: 56211

Write pseudocode to enter a 4-digit number. Generate and add the control digit to the 4-digit number. Display the ticket number. (8) [8]

```
TicketNum ← read ticket number as string✓
Counter ← 1
Cd ← 0
X ← 0
Total ← 0
Loop until counter = 5✓
   X ← TicketNum[counter]  converted to an integer✓
   Total ← Total✓ + x*(7 - Counter)  ✓
   Counter ← Counter + 1✓
Endloop
Cd ← Total modulus 5✓
TicketNum ← TicketNum + Cd converted to string
Output TicketNum✓
```

5.3 Learners are allowed to pay their school fees in full during the first 10 months(January to October) of the year before warning letters are issued to them. The number of learners that paid their school fees in full for each of the months is stored in an array called SchoolFees as indicated below:

SchoolFees:

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Value	128	240	55	72	66	108	85	88	60	212

The software developer has designed the following algorithm:

```
Line
1       Total ← 0
```

```
2   Counter ← 5
3   Average ← 0
4   Loop until Counter > 10
5       Counter ← Counter + 1
6       Total ← Total + SchoolFees[Counter]
7   End Loop
8   Average ← Total/Counter
9   Display Average
```


5.3.1 Suggest a suitable data type for variable

(a) **Average** (1)
Real✓

(b) **Counter** (1)
Integer✓

5.3.2 The program generates, a run-time error.

(a) Explain what a run-time error is in general. (1)
An **error** that occurs during the execution✓ of a program.

(b) The run-time error indicates that line 5 of the given algorithm caused the error. Rewrite line 4 of the algorithm in order to correct the error. (2)
Loop until counter > 9✓✓

5.3.3 Assume that the error in line 4 has been corrected. When the program is executed, an incorrect value for the variable Average is displayed.

(a) What type of programming error is generally associated with incorrect output? (1)
Logical error✓

(b) Rewrite a single line from the algorithm above which will fix the error and output the correct average. Also indicate the line number of the statement that you are rewriting in your answer. (2)

2 ✓ Counter ← 0✓

[8]

SECTION E: INTEGRATED SCENARIO.

QUESTION 6.

The administrative building (Secretary's Office) will be the central hub from which all school activities will be managed and monitored.

6.1 The school secretary says she notices suspicious activities on her computer. She suspects that unauthorised software is running on her computer. (2) [2]
State two types of programs that can be used to retrieve data from a computer without permission or knowledge of the user.

Any TWO of:
✓✓
- Trojan horse
- Key logger
- Malware
- Spyware
- Rootkit

6.2 When purchasing tickets for school events online, users need to provide personal information in order to create a user account.

(a) State two precautions to prevent identity theft, which can occur during this process. (2)
Create strong passwords and change them regularly.
Keep personal and sensitive information safe.
Do not share information like your ID No., passwords and pin numbers.
(any two correct ways of preventing ID theft) ✓✓

(b) Suggest two ways to ensure that a password for a user account is strong. (2)
Any TWO ✓✓
The password should contain:
- uppercase and lowercase characters
- a combination of numeric and alphabetical characters
- special characters
- at least 8 or more characters
- no personal/predictable information
- no standard dictionary words
- no patterns/repetition

(c) State two ways the learner will know that the school website is a secure website. (2) [6]

Any TWO ✓✓
- Https in the URL
- Padlock in the browser
- Check the digital certificate of the website

6.3 The programming team suggests the use of Software as a Service (SAAS) and the possibility of using a web-based office suite such as Google Docs.

(a) State two advantages of using cloud applications. (2)

- No need to purchase software as it is part of the service
- Software will always be the latest having all features updated regularly.
- Save on hardware – do not have to purchase large hard drives for installation of software.

(any two reasonable advantages) ✓ ✓

(b) Briefly explain the difference between cloud backup services and cloud syncing services. (2)

*Cloud backup service: (*Any ONE ✓)
- There is a proper backup schedule where specified files are backed up first, duplicate copies of changed files are made and files are encrypted/for your access only/private

Cloud syncing services: ✓
- Software monitors the changes made to your files and mirrors the changes to the online storage/back to the device/all devices will have the same copy [4]

6.4 In addition, the schools' will provide Wi-Fi access to learners and educators.

6.4.1 Name the medium used to transfer data in a Wi-Fi network. (1)
Radio waves ✓

6.4.2 Wireless access points will be installed at various places on the school campus.

(a) What is the function of a Wi-Fi access point? (1)
To allow wireless devices to connect to the network. ✓

(b) Give two reasons why multiple access points will be needed. (2)
The school campus is large and different sections✓ of the campus will require access points in order for many✓ devices to connect to the network.

6.4.3 Learners will use their mobile devices (tablets) to access the Internet

at school.

(a) What does it mean when one describes a mobile device as having '*always on*' functionality? (2)

The operating system is designed to keep the device on and working at all times ✓as it is performing tasks in the background✓ even when the screen is dark.

(b) Suggest two ways that can be used in order to improve the battery life of a mobile device when in use. (2)

Any TWO ✓✓
- Set screen to switch off automatically when not in use
- Close applications that are not used
- Turn off GPS
- Turn off Wi-Fi/Bluetooth
- Do not play media files for longer than necessary

6.4.4 Which cellular technology could also be used to access the Internet? (1) [9]
Any ONE ✓
3G/4G/LTE

6.5 Often learner's iPads and tablets become infected with *malware*.

6.5.1 What is *malware*? (1)
Malware is malicious software ✓ designed to negatively affect the functioning of the computer.

6.5.2 State two symptoms that may indicate that a computer or iPad has been infected by a virus. (2)
Any TWO ✓✓
- Anti-virus program reports virus detected
- Error messages pop-up
- Files start disappearing
- Computer slows down dramatically
- Free space is reduced
- Computer no longer boots up

6.5.3 If a website interfaces with the school's database, it is possible that it may be subjected to an SQL injection attack. State two ways of preventing an SQL injection attack. (2) [5]
Validate data fields. ✓
Avoid entering SQL statements into data fields. ✓
Restrict access to the database.
Avoid disclosing database error information.
(any 2)

6.6 Documentaries and movies containing educational content are useful to watch and can improve understanding of sections being taught. Learners are told that they can download useful material

using BitTorrent.

6.6.1 What is *BitTorrent*? (2)
A peer to peer protocol ✓ used to share large files across the Internet (or other large network)✓

6.6.2 Is it legal for the learners to download movies and documentaries using BitTorrent? Justify your answer. (2) [4]
No, BitTorrent itself is merely a file sharing protocol ✓ and is not illegal to use however the user must guard against illegal downloading software. ✓

6.7 The majority of teachers are now using e-learning to teach certain aspects of their lesson.

6.7.1 State two ways in which e-learning may be beneficial to the learner. (2)
Increased retention and stronger grasp on concepts,
Learner can view and lean at his/her own pace,
The content provides a consistent message,
(any 2 reasonably correct advantages to the learner) ✓✓

6.7.2 Lesson videos are made to download or stream. What is the difference between downloading and streaming. (2) [4]
Streaming:
- Watching movies online/from web site as it is streamed/in real time ✓

Downloading:
Content is saved on your local drive and you have a copy available to you. ✓

TOTAL: 150 MARKS.