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GRADE 12

INFORMATION TECHNOLOGY: PAPER II

NAME:

TIME: 3 HOURS

MARKS: 150

EXAMINERS: Cluster

MODERATORS: Another Cluster

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of **25** pages.
 2. Read the questions carefully and make sure that you answer all parts of each question.
 3. Answer on the question paper. Please make sure that you write your name on the line above.
 4. Answer **ALL** questions – there are no options in this paper.
 5. Show all working where applicable.
 6. A non-programmable calculator may be used.
 7. It is in your own interest to write legibly and to present your work neatly.
 8. **TWO** blank pages (**pages 24 to 25**) are included at the end of the paper. If you run out of space for a question, use these pages. Clearly indicate the question number of your answer should you use this extra space.
-

FOR MARKER'S USE ONLY

Question	1	2	3	4	5	6	7	8	Total
Marks	10	10	31	22	16	13	23	25	150
Marked									
Moderated									

SECTION A**SHORT QUESTIONS****QUESTION 1****DEFINITIONS**

Give the most appropriate term for each of the following expressions:

- 1.1 A type of operating system (OS) designed to perform a specific task for a dedicated device. (1)

- 1.2 A standard for connecting high-definition video devices. (1)

- 1.3 The bus used to connect the CPU to the RAM. (1)

- 1.4 An Internet protocol that is an extension to FTP that lets clients edit remote content on the web. (1)

- 1.5 An open-source browser that protects and hides both the sender and receiver's data transmitted over the Internet. (1)

- 1.6 A process in which different types of data are checked for accuracy and inconsistencies after data migration or transmission. (1)

- 1.7 A hardware technique that stores data on multiple drives to protect data in the case of a drive failure. (1)

- 1.8 The interconnection via the Internet of computing devices embedded in everyday objects, enabling them to send and receive data. (1)

- 1.9 A programming technique used to hide background details or implementation of an object. (1)

- 1.10 A document stipulating constraints and practices that a user must agree to for access to a corporate network, the internet or other resources. (1)

[10]

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QUESTION 2**MATCHING COLUMNS**

For each of the terms in Column A below, you should select the **most correct** definition in Column C, matching the letter to the question number. You should merely write down the appropriate letter in Column B. An example is shown as Question 2.0, using "W" as the correct answer.

Column A	Column B	Column C
2.0	W	
2.1 Unprocessed raw facts.		A LBS
2.2 A self-replicating program that is able to propagate itself across a network, typically having a detrimental effect.		B Mesh Topology
2.3 A device that provides battery backup when the electrical power fails or drops to an unacceptable voltage level.		C Data
2.4 Services that are based on the location of a mobile user as determined by the device's geographical location.		D Star Topology
2.5 The part of the World Wide Web that is not discoverable by means of standard search engines, including password-protected or dynamic pages and encrypted networks.		E UPS
2.6 A type of networking where most nodes do not require a power source.		F Bridge
2.7 A program that converts a low-level language to a series of bits.		G Assembler
2.8 A specification for a software program that connects a computer's firmware to its operating system.		H Worm
		I Router
2.10 A network device that reduces network traffic by only forwarding packets to the next segment based on the MAC addresses.		J Inverter
		K Deep web
		M Anti-Virus
		N BIOS
		O POPI
		P Compiler
		Q UEFI
		R Freeware
		S Freemium

[10]

SECTION B

SYSTEM TECHNOLOGIES

SCENARIO

Consider the following scenario when answering the rest of the examination paper, unless the questions are of a general nature or otherwise stated.

The Government of South Africa wants to upgrade the current voting system to an electronic vote counting device where voters can enter their vote and their vote is automatically processed.

The current voting may still need to be a hybrid of physical ballots or can be completely electronic, based on the needs of the country. A company called Dominion is interested in providing a solution, guarantees security and validity, but safeguards must be put into place in order to ensure a free and fair election.

Seleccione hasta 10 candidatos. No rellene más de 1 óvalo por columna.

	1 1st Choice 1a. Opción	2 2nd Choice 2a. Opción	3 3rd Choice 3a. Opción	4 4th Choice 4a. Opción	5 5th Choice 5a. Opción	6 6th Choice 6a. Opción	7 7th Choice 7a. Opción	8 8th Choice 8a. Opción	9 9th Choice 9a. Opción	10 10th Choice 10a. Opción
OCEAN OCÉANO	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐
MOUNTAIN MONTAÑA	☐	☐	☐	☐	☒	☐	☐	☐	☐	☐
GLACIER GLACIAR	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐
FOREST BOSQUE	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
BEACH PLAYA	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
DESERT DESERTO	☐	☐	☐	☐	☐	☒	☐	☐	☐	☐
WATERFALL CASCADA	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
VALLEY VALLE	☐	☐	☐	☐	☐	☐	☐	☒	☐	☐
RIVER RIO	☐	☐	☐	☐	☐	☐	☐	☐	☒	☐
CANYON CAÑÓN	☐	☐	☐	☐	☐	☐	☒	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Voters mark their choices in order of preference from first to last in ranking

Vote both sides of ballot
Vote en ambos lados de la boleta



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QUESTION 3 APPLICATION

The government is considering TWO hardware devices to enter votes at voting stations. The specifications for each device are listed below:

**LG Voting Machine**

Processor: 2.1 GHz Intel Quad Core i5
 Memory: 8 GB RAM
 Storage: 500 GB HDD
 Display: 13" LCD touch screen
 Network: 802.11ac 2.4/5 GHz
 Ports: 2 x USB 3; 1 x USB C
 Additional: Biometric hand/fingerprint scanner

**Nokia T20 Tablet**

Processor: 1.8 GHz Octa-core T610
 Memory: 4 GB RAM
 Storage: 64 GB SDD
 Display: 10.4" LED touch screen
 Network: 802.11ac 2.4/5 GHz
 Ports: 1 x USB C
 Additional: Front/Rear camera

3.1 Neither of these devices have a graphics co-processor.

3.1.1 What is the purpose of a graphics co-processor?

(2)

3.1.2 Name ONE other type of co-processor.

--

(1)

3.1.3 Explain why both devices would benefit if they had a graphics co-processor.

(2)

3.1.4 Do you think it would be possible to upgrade either device to include a graphics processor? Place an X next to your chosen answer.

Yes

--

No

--

Justify your answer.

(2)

3.2 Multiprocessing and hyperthreading:

3.2.1 Define multiprocessing.

(2)

3.2.2 Define hyperthreading.

(2)

[PLEASE TURN OVER]

- 3.2.3 Explain how both hardware techniques improve the speed at which instructions are processed.

(2)

- 3.2.4 Name TWO software techniques associated with multiprocessing and hyperthreading.

Technique 1:
Technique 2:

(2)

- 3.2.5 Explain how the techniques you named in 3.2.4 can work together with multiprocessing and hyperthreading to efficiently process instructions.

Technique 1:
Technique 2:

(2)

- 3.2.6 The LG Voting Machine's processor is hyperthreaded. Which device do you think will execute instructions faster? Place an X next to your chosen answer.

LG Voting
Machine

--

Nokia T20 Tablet

--

Justify your answer providing TWO reasons.

Reason 1:
Reason 2:

(3)

3.3 The Nokia T20 Tablet has 64GB SDD (sold state drive) storage.

3.3.1 Give TWO reasons why the Nokia's storage is so much less than the LG Voting Machine which has 500 GB HDD (hard disk drive).

Reason 1:
Reason 2:

(2)

3.3.2 Both devices will need to run a voting application that will display the voting options, input the user's choice, and update the voting results.

Should this application be installed locally on the device or should it be web-based?

Locally installed

Web-based

Justify your answer providing TWO reasons.

Reason 1:
Reason 2:

(3)

3.4 Both devices have an Android operating system installed.

3.4.1 Give THREE functions of an operating system.

Function 1:
Function 2:
Function 3:

(3)

[PLEASE TURN OVER]

3.4.2 What type of software licencing is used by Android?

--

(1)

3.5 Some of the software developed by Android can be run on different operating systems. Explain how a two-stage compiler can be used to ensure that software can be portable across operating systems.

(2)

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SECTION C INTERNET AND COMMUNICATION TECHNOLOGIES**QUESTION 4**

4.1 Devices in a network can be thin or fat clients.

4.1.1 Define a **thin client**.

(2)

4.1.2 Give TWO reasons why both devices are **fat clients**.

Reason 1:
Reason 2:

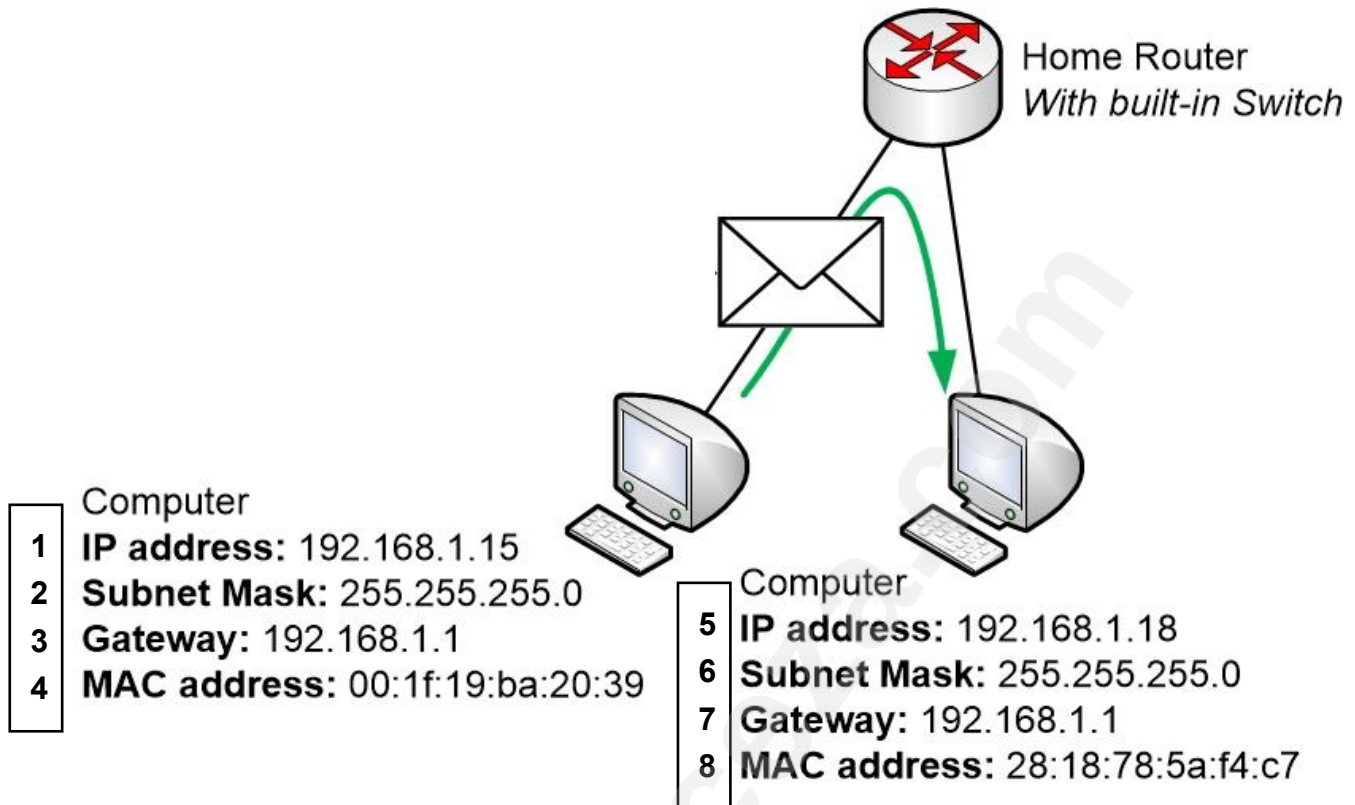
(2)

4.1.3 If the voting application was web-based, the devices would be smart clients. Explain why.

(2)

[PLEASE TURN OVER]

4.2. Study the network diagram of two computers connected to home router.



4.2 What type of cable would be used to connect the computers to the home router.

(1)

4.2.1 Give TWO advantages of this type of cable.

Advantage 1:
Advantage 2:

(2)

4.3 What type of topology is used in this network?

(1)

4.4 Name the protocol responsible for mapping IP addresses to MAC addresses.

(1)

- 4.5 Use the labels 1 to 8, to complete the details of the frame sent from the computer on the left to the computer on the right. Merely write down the number in the appropriate block below.

				Packet Data with CRC	Trailer with FCS
--	--	--	--	-------------------------	---------------------

(4)

- 4.5.1 The frame has both CRC and FCS which both address a similar problem. What is the purpose of CRC and FCS. Do not write out the acronyms.

(2)

- 4.5.2 If CRC and FCS are similar, why is it necessary to have both?

(2)

- 4.6 The home router is also a switch.

- 4.6.1 What is the purpose of a router?

(2)

- 4.6.2 What would the IP Address of the router be in this network? Write down a number 1 to 8 using the labels.

--

(1)

[22]

[PLEASE TURN OVER]

QUESTION 5

- 5.1 The government has a website that interactively delivers up-to-date results of the as votes are made. The web site home page displays the results of the province based on the user's location

5.1.1 Explain why this is an example of Web 3.0?

(1)

- 5.2 Name and describe TWO features that the web site could use to improve Search Engine Optimisation (SEO).

Feature 1:
Description 1:
Feature 2:
Description 2:

(4)

- 5.3 In this scenario, it is critical that there are no errors in capturing and processing the data. Give TWO sources of errors and provide an example using the scenario.

Error Type 1:
Example 1:
Error Type 2:
Example 2:

(4)

- 5.4 Explain how a Denial of Service attack could affect an election?

(2)

5.5 The database storing the election results needs to be frequently backed up.

5.5.1 How often do you think a backup should be made? Place an X next to the answer you choose.

Hourly

☐

Daily

☐

Monthly

☐

Provide ONE reason for your choice.

(3)

5.5.2 It has been discovered that the database has been corrupted. Considering your answer in 5.5.1, how would the database be corrected so that it is correct?

(2)

[16]

[PLEASE TURN OVER]

SECTION D**SOCIAL IMPLICATIONS****QUESTION 6**

6.1 Explain how the electronic voting system would be an example of green computing.

(2)

6.1.1 Give TWO reasons why the electronic voting system would NOT contribute to green computing.

Reason 1:
Reason 2:

(2)

6.2 The electronic voting system identifies each voter using their South African ID number or passport number provided by the government. The voting system cannot legally access all the data stored by the government about a person residing in South Africa.

6.2.1 What is the name of the law that ensures that a person's data may not be accessed without a valid reason or purpose.

--

(1)

6.2.2 Name TWO examples of data that the government has legally stored about a person but may not be accessed by the electronic voting system.

Example 1:
Example 2:

(2)

- 6.3 Give TWO challenges that would be encountered if South Africa had to implement an e-voting system.

Challenge 1:
Challenge 2:

(2)

- 6.3.1 For each of the above challenges provide a possible solution.

Solution 1:
Solution 2:

(2)

- 6.4 Political parties would like to have a list of names of who has voted for them.

Do you think this will be a violation of a person's right to privacy?

Yes

No

Justify your answer.

Reason 1:
Reason 2:

(2)

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SECTION E DATA AND INFORMATION MANAGEMENT AND SOLUTION DEVELOPMENT

QUESTION 7

It has been decided that the software for the voting machines will be created by South African programmers. To be able to deal with voters who use the electronic voting system and voters who will vote using a paper-based system, TWO objects need to be created. The **PVoter** class for paper-based voters and the **EVoter** for users of the electronic voting system.

The **PVoter** Class

PVoter objects will be instantiate using this class. Each **PVoter** object will have the following fields:

Field name	Field data type	Field description
ID	Integer	This field contains the government ID or passport number of the voter.
voteStatus	Boolean	This field indicates whether the voter has voted yet.
ballotNumber	String	The unique number of the ballot paper given to the voter.
numPVoter	Integer	This field will store to total number of voters who have voted using a paper ballot sheet.

Methods:

- A constructor with parameters named **id**, **vs**, **bn** to assign values to the **ID**, **voterStatus** and **ballotNumber** fields respectively.
- An accessor and mutator method for the **voteStatus** field.
- A **toString** method

The **EVoter** Class

EVoter objects will be instantiate using this class. Each **EVoter** object will have the following fields:

Field name	Field data type	Field description
ID	Integer	This field contains the government ID or passport number of the voter.
voteStatus	Boolean	This field indicates whether the voter has voted yet.
deviceID	String	The unique number of the device the voter used to cast their vote.
numEVoter	Integer	This field will store to total number of voters who have voted using the. electronic voting system.

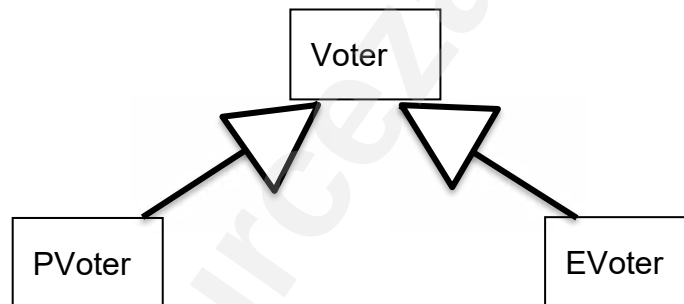
Methods:

- A constructor with parameters named **id**, **vs**, **dId** to assign values to the **ID**, **voteStatus** and **deviceID** fields respectively.
- An accessor and mutator method for the **voteStatus** field.
- A **toString** method

7.1 What fields do both classes have in common?

(2)

7.1.1 Since there are common fields, a super class object called **Voter** will be created and both the **PVoter** and **EVoter** will inherit from the **Voter** class. Complete the class diagram for a class called **Voter** using the details provided for **PVoter** and **EVoter**.



Voter
Fields:
Methods:

(8)

com

7.2 Explain why **numPVoter** and **numEVoter** must be defined as public static fields.

Public:
Static:

7.2.1 An application instantiates a **PVoter** class with the code:

Write code to display the value of the **numPVoter** field in the application.

Free

7.3 Explain how **polymorphism** will be used when an **EVoter** or **PVoter** object is instantiated.

(2)

7.4 Name ONE method that will be overridden in the **Voter** and **PVoter** class.

(1)

[23]

QUESTION 8

8.1 You have been asked to use Boolean logic to help them determine which users voting stations need attention. New machines must be installed and machines not guaranteed and are older than 5 years must be serviced.

For the purposes of this question:

G = a machine that is under guarantee.

O = a machine older than 5 years

N = a new machine that needs to be installed.

Based on this information, the condition for servicing a machine is:

$$F(G,O,N) = (G'.O) + N$$

8.1.1 Complete the truth table below to represent the condition shown above.

G	O	N	G'	G'.O	(G'.O)+N
0	0	0			
0	0	1			
0	1	0			
0	1	1			
1	0	0			
1	0	1			
1	1	0			
1	1	1			

(6)

8.1.2 Write the function F(G,O,N) using the results of the trace table.

F(G,O,N) =

(4)

8.1.3 Use De Morgan's Law to determine $F'(G,O,N)$

--

(4)

8.2 You were asked to code an algorithm that would determine whether a technician can be promoted to a senior technician. The criteria for a promotion are as follows:

- The technician needs to have at least 2 clients.
- There may not be more than 5 senior technicians currently.

The algorithm below checks whether “Matt Watt” can be promoted by checking an array listing the technicians used by three voters as is indicated below:

techArray[]

techArray[0]	techArray[1]	techArray[2]
Matt Watt	Joe Barr	Matt Watt

The current number of senior technicians is 4.

1	techName $\leftarrow$ "Matt Watt"
2	techASize $\leftarrow$ 3
3	clientAmount $\leftarrow$ 0
4	stAmount $\leftarrow$ 4
5	for x $\leftarrow$ 1 to techArraySize-1 inc by 1
6	if techArray[x]=techN
7	clientAmount $\leftarrow$ clientAmount+1
8	end if
9	end for
10	if clientAmount>2 AND stAmount<5
11	return techname+ " can be promoted."
12	else
13	return techname+ " cannot be promoted."
14	end else
15	end if

Unfortunately, the algorithm produces unexpected output.

Complete the following **trace table** to determine where the error in the algorithm lies.

You have been provided with the first 2 lines.

line	techName	techASize	clientAmount	stAmount	x	techArray[x] = techName?	amountOfClients>2 AND amountOfST<5?	Output
1	Matt Watt							
2		3						
3								

(8)

8.2.1 Write down the **line number** of the algorithm where the error can be found.

(1)

8.2.3 Explain how to correct the error.

(2)

[25]

Total: 150 marks

REMEMBER TO CLEARLY INDICATE AT THE QUESTION THAT YOU USED THE ADDITIONAL SPACE TO ENSURE THAT ALL ANSWERS ARE MARKED.

[illegible]

