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INFORMATION TECHNOLOGY PAPER I - MEMO
Grade 11
NOVEMBER EXAMINATION 2018

Marks: 150
Time: 2 ½ hours
Moderator: D Kench
Reading Time: 10 minutes

Examiner: J Nocton-Smith

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 24 pages (including the extra pages and front cover). Please check that your question paper is complete.
2. Read the questions carefully and make sure that you answer all parts of each question.
3. Answer ALL questions in the space provided. TWO blank pages have been included at the end of the paper. Number each question clearly on these pages, should you use the space.
4. Show all working where applicable.
5. A non-programmable calculator may be used.
6. It is in your own interest to write legibly and to present your work neatly.

	Q 1	Q 2	Q 3	Q4	Q 5	Q 6	Q 6	Q 7	Total
Possible Marks	10	10	18	14	28	20	12	38	150
Actual Marks									

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Question 1**Terminology****10 Marks**

Define the following terms. Do NOT expand the acronym. You may use an example to support your answer once you have provided a definition. Please note that examples on their own will not be given any credit. Please do not use brand names.

1.1 CMOS

(2)

Volatile memory to store user✓ and computer settings. ✓

1.2. TCP/

(2)

is a suite of communication protocols ✓used to interconnect network devices on the internet✓

1.3 Social Engineering

(2)

the use of deception to manipulate individuals into divulging confidential or personal information ✓that may be used for fraudulent purposes. ✓

1.4 Encryption

(2)

is the method by which plaintext or any other type of data is converted from a readable form to an encoded version ✓that can only be decoded by another entity if they have access to a decryption key. ✓

1.5 Checksum

(2)

A value used to ensure data are stored or transmitted without error. ✓It is created by calculating the binary values in a block of data using some algorithm and storing the results with the data. ✓

Question 2**Terminology****10 Marks**

For each term in Column A select the matching description in Column C. Place the corresponding letter in Column B.

Column A		Column B	Column C	
2.0	Computer Term	V	A.	A fraudulent website using for identity theft.
2.1	Plug-in	K	B.	A type of semi-conductor memory that does not need to be refreshed as the transistors inside would continue to hold the data as long as the power supply is not cut off.
2.2	Scripting	O	C.	A unique identifier assigned to a network interface card.
2.3	MAC Address	C	D.	An object-oriented programming concept of wrapping the data (variables) and code acting on the data (methods) together as a single unit.
2.4	Phishing	I	E.	Small files which are stored on a user's computer designed to hold a modest amount of data specific to a particular client and website.
2.5	Encapsulation	D	F.	A system that uses tags, or labels attached to the objects to be identified. Two-way radio transmitter-receivers called interrogators or readers send a signal to the tag and read its response.
2.6	Cookies	E	G.	Storage device on a network for vast volumes of data with an IP address
2.7	SRAM	B	H.	A unique string of numbers separated by full stops that identifies each computer using the Internet Protocol to communicate over a network.
2.8	jpg	M	I.	An email sent to lure users to fraudulent websites..
2.9	NAS	G	J.	An internet protocol for email retrieval.
2.10	RFID	F	K.	Software that adds functionality to a browser.
			L.	An image format used on the Web that provides lossless compression.
			M.	An image format used on the Web that provides lossless compression.
			O	A technique used in web development which involves employing code on a web server which produce a response customized for each user's (client's) request to the website.

Scenario

Consider the scenario below when answering the rest of the examination paper:

The SA High school hackathon is an annual event that allows schools to enter teams to participate in a hackathon. The teams attempt to solve as many problems as possible during the heats which take place at the schools. The top team from each of the ten best performing schools is invited to the Final hackathon in Johannesburg. The competition is managed the High School Hackathon Society who have a small team based in Johannesburg.

Question 3**Hardware****18 Marks**

All participants should have their own laptops – the society have suggested the following minimum specifications for devices.

CPU	
CPU Type	Intel Dual Core Processor
CPU Speed	N3050 1.6GHz
CPU Support	2M Cache up to 2.48GHz
Graphics	
GPU/VPU	Intel HD Graphics 400
Video Memory	Shared system memory
Graphic Type	Integrated Card
Hard Drive	
HDD	500GB Hard Drive
HDD RPM	5400rpm
HDD Interface	SATA
Memory	
Memory	4GB DDR3
Memory Speed	DDR3L 1600
Memory Spec	4GB x 1
Memory Slot (Total)	1
Memory Slot (Available)	0
Optical Drive	
Optical Drive Type	No DVD Drive Included
Communications	
WLAN	802.11 ac Wireless LAN
LAN	10/100Mbps
Bluetooth	Bluetooth 4.0

3.1 The CPU has a **Dual-Core** processor. Explain the term dual core.

(1)

A **dual-core processor** is a CPU with two **processors** or "execution **cores**" in the same integrated circuit✓

3.2 There are different types of memory available on the computer system:

Cache, primary memory (RAM), secondary memory (Hard drive)

Explain the **function** of each type of memory

(6)

Cache:

Cache memory is a small-sized type of volatile computer **memory** that provides high-speed data access to a processor ✓and stores frequently used computer programs, applications and data.✓

Can be accessed more quickly than RAM✓

Primary Memory:

Also known as RAM stores data and instructions for programs in execution. ✓Is volatile and will lose info if power lost✓

Secondary Memory:

Used for permanent/long term storage ✓of data and programs✓

3.3 EEPROM is a special type of PROM that can be electronically erased.

3.3.1 What is the software called that is saved on an EEPROM?

(1)

Firmware (allow BIOS)

3.3.2 Give an example of software that is saved on an EEPROM.

(1)

BIOS

- 3.4 As a programmer you may find the specs for this laptop too limiting. Choose one specification that you would change. Give the updated spec and the reason for your choice. (2)

New Specification:
RAM/processor/SSD
...allow anything reasonable
Reason:
Max of 4 GB very limiting – would like a min of 8, however only one slot available on the motherboard

- 3.5 The specifications describe an integrated video card.

- 3.5.1 What does the term *integrated* refer to in this context? (2)

There is not a discreet video card. ✓The display circuitry is placed in the chipset on the motherboard or on the same chip as the CPU✓

- 3.5.2 Give ONE advantage and ONE disadvantage to an integrated video card. (2)

Advantage:
Lower cost, space saving (more compact)✓
Disadvantage:
Shares memory with CPU✓

- 3.6 Explain what HDMI is used for. (1)

A digital interface for audio and video✓

3.7 Explain the term virtual memory.

(2)

A common function in most every OS and hardware platform, virtual memory uses storage (hard drive or solid state drive) to temporarily hold what was in RAM. ✓

The computer's real memory (RAM) is broken up into smaller segments, called "pages," typically 4KB in size. When RAM fills up, pages not currently in use by open applications are written to storage in a virtual memory "swap file." ✓

When any swapped out page in storage is required again, once again a page in RAM is written to storage to make room, and the required page in storage is retrieved.

Question 4**Software****14 Marks**

- 4.1 The operating system is responsible for **PROCESS** management. (2)
Describe TWO process management functions that must occur

Each process gets enough CPU time to carry out its task ✓

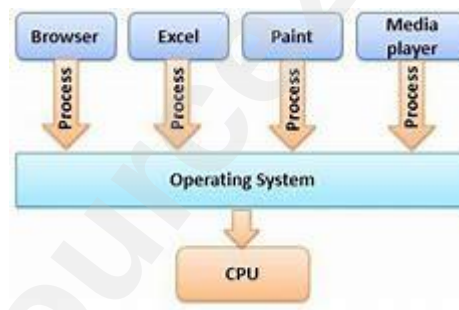
CPU used efficiently ✓

Each process gets the resources it needs

- 4.2 Operating systems use different processing techniques to handle many tasks at the same time.

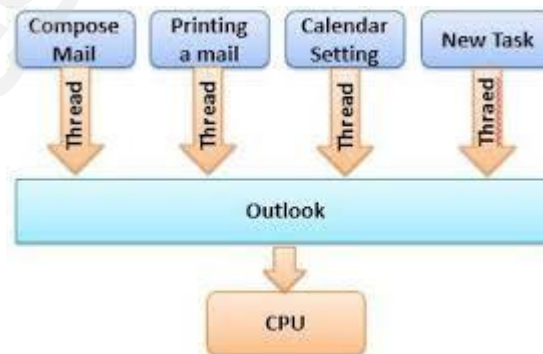
- 4.2.1 Identify each of the processing techniques illustrated below. (2)

(a)



Answer: **Multitasking** ✓

(b)



Answer: **Multithreading** ✓

- 4.2.2 Explain how an operating system working with a dual core processor (2)
incorporates the processing techniques above for maximum performance.

Each core✓ can be allocated a task/thread✓

- 4.3 An interrupt is a signal sent to the CPU from hardware or software indicating the (4)
need for the CPUs attention. Give an example of a software interrupt and a
hardware interrupt.

Software:

Generated from programs ✓eg when IO is required✓

Hardware:

Sent from HW device✓ eg on a keyboard when a key has been pressed✓

- 4.4 The participants at the hackathon can use any programming language they choose (4)
to complete the problems.

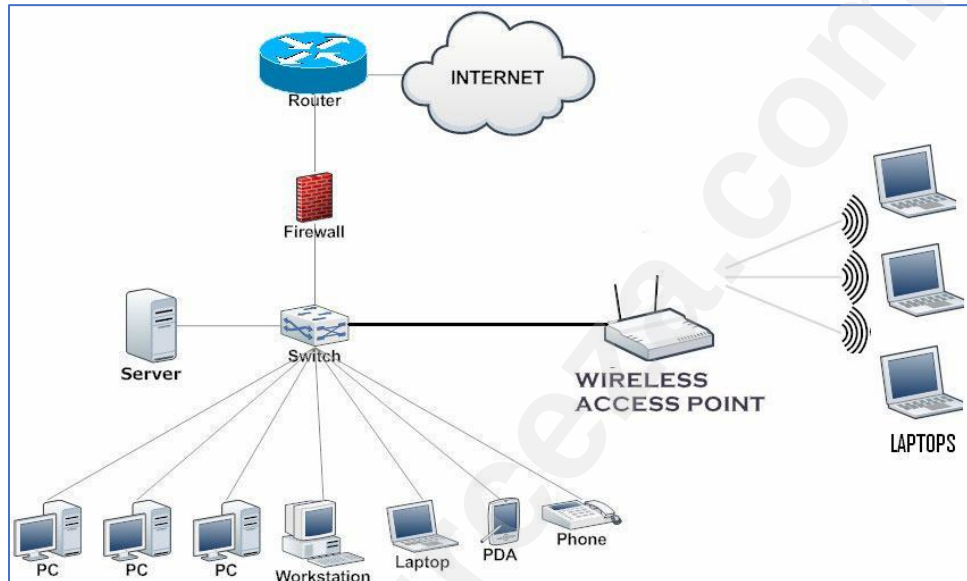
Match the language listed in column A with the description in column C. Place the
corresponding letter in Column B

Column A	Column B	Column C	
Computer Language	V		Description
Assembler code	C	A.	Example of programming language that uses a virtual machine to execute programming code.
java	A	B.	High-level language that will create an executable file when a program is compiled.
Machine code	D	C.	Low level language using English acronyms to represent corresponding binary code.
Delphi	B	D.	Program in binary code.

Question 5**Networks****28 Marks**

The High School Hackathon Society have a small head-office in Johannesburg with PCs and tablets. They employ 4 permanent staff, however need flexibility for extra staff who assist when the hackathon finals are taking place.

The diagram below shows the layout of the network and some of the device that will be used.



- 5.1 Give TWO different examples why connecting the computers in a network would be of benefit to the Hackathon Society. (2)

Example 1: share data, share HW eg printer, manage users on NW

Example 2: communications, link to internet/external organisations

Anything reasonable

- 5.2 The network at the head-office includes a **file-server**.

The server is more “powerful” than the other computers on the network. Give TWO hardware specifications of components/devices or factors that determine how ‘powerful’ a computer is. (2)

Specification 1: More storage

Specification 2: faster processor, more memory

5.3 UTP cables are used for the LAN in the office.

5.3.1 Signal attenuation is one of the weaknesses of UTP cables

(2)

State **TWO** other weaknesses of UTP cables.

EMI: signals can be corrupted by signals from other sources

Eavesdropping: signals traveling along copper cables can be intercepted by others.

Attenuation: Signal loses strength

Crosstalk: interference adjacent wires

5.3.2 If UTP cables are to be used over a very long distance, suggest how the signal attenuation problem can be solved without replacing them with fibre-optic cables.

(1)

Use a repeater every 100m to boost the signal

5.3.3 What device is needed to connect UTP cabled devices to the server in a star topology?

(1)

switch

5.4 The diagram shows the position of the router and firewall on the network. Explain why the placement of these two devices could be problematic.

(2)

Firewall needs to be first device linked to Internet for security.

5.5 To ensure data is transferred without errors, parity is used.

5.5.1 Explain what parity is and provide an example using 10111010 and even parity. (3)

Extra bit added to 8 bits to detect errors.

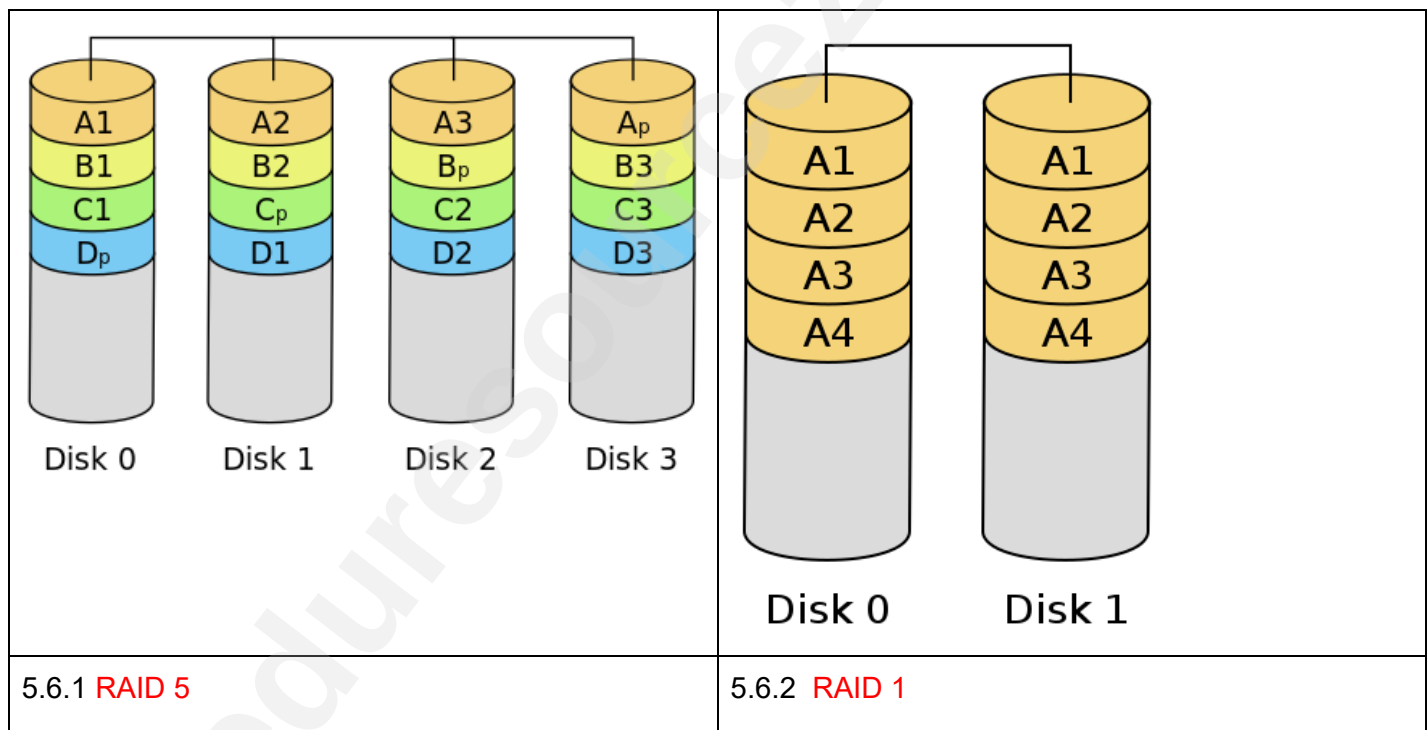
10111010 parity bit will be 1.

5.5.2 How is parity different to a checksum? (2)

Parity counts the number of 1s in 8 bits and checksum adds a larger block of data.

5.6 The file server supports RAID technology. (4)

Identify the type of RAID indicated by the diagrams below using the space provided.



5.6.3 How many hard drives would you require for the type of RAID you have chosen? (1)

~~4 or 2 depending on answer.~~ NOT MARKED – QUESTION REDUCED BY 1

5.7 Hackathons have very real and unique Internet and WiFi needs.

- 5.7.1 A wireless mesh network would be suitable to support a large number of power users. (4)
Describe two advantages of a wireless mesh networks.

Advantage 1:

Wireless ✓ – no need to lay cables, easy to add extra nodes ✓

Advantage 2:

Self healing ✓ – will reconfigure itself if one node goes down ✓

- 5.7.2 Do you think a Wireless Mesh Network is suitable? Justify your answer (2)

No – Bandwidth will be shared OR part of the bandwidth will be lost to keep communication between nodes.

- 5.7.3 The wireless mesh nodes offer the following security protocols.

- WEP
- WPA
- WPA2

- 5.7.3.1 Which protocol would you select for a hackathon? (1)

WPA2 ✓

- 5.7.3.2 Describe one advantage of the protocol you have chosen. (1)

Unique encryption key for each client ✓

Uses longer key and unique key per packet making it more secure ✓

- 5.7.4 Explain the term GPS (2)

Determine location ✓ of a device using satellites. ✓

Question 6**e-Communication and security****20 Marks**

- 6.1 The Hackathon Society has a dynamic website which contains a link to podcasts and videos created by the previous winning teams. And links to the hackathons social networking tools.

6.1.1 What is a podcast?

(2)

a digital ✓ audio file ✓ made available on the Internet for downloading to a computer or mobile device, ✓.

- 6.1.2 The videos on the website can be streamed. Explain the concepts of streaming. (2)

video **streaming**, is when a multimedia file can be played back ✓ without being completely downloaded from the internet first. ✓

- 6.1.3 The videos could be downloaded instead of streamed. Define downloading (4) and give two reasons why a user may choose to download rather than stream.

Define Download: Copy entire file ✓ before viewing. ✓

Poor Internet speed ✓

Watch multiple times ✓

- 6.2 Attendees like to be able to connect with other participants before the event. They (4)
can connect via social media or specific online organizing tools. This way,
participants can forge relationships and generate ideas before the event. It is a
good way to market the event, plus, it gets everyone excited.

Name two social media platforms that could be used to connect the participants.
For each social media platform explain the benefits of using it.

Social Media Platform1:
Facebook, instagram, twitter, WhatsApp, Discord : anything reasonable
Social Media Platform2:

- 6.3 The High School Hacker Society's network at the office may be vulnerable to malicious software entering the environment.

Two such malicious software items are **ransomware** and a **rootkit** virus.

- 6.3.1 Describe the term ransomware. (2)

Ransomware is a type of malware program that infects, locks or takes control of a system✓ and demands ransom to undo it. ✓ Ransomware attacks and infects a computer with the intention of extorting money from its owner.

- 6.3.2 Describe the term rootkit. (2)

A rootkit is software✓ used by a hacker to gain constant administrator-level access to a computer or network. ✓

- 6.4 Explain how each of the following security measures will help secure the system from either ransomware or a rootkit virus.

6.4.1 Firewall

(2)

A firewalls will block✓ unauthorized access to the network✓

6.4.2 Backups

(2)

Copy data✓ to a separate location✓

Question 7**Social****12 Marks**

- 7.1 The definition of a hackathon is any event of any duration where people come together to solve problems. (4)

The theme for the finals of the 2018 Hackathon will be **Hack-for-Good**. The purpose will be to make websites for non-profit organisations in South Africa mobile friendly, with a particular focus on education and learning.

Describe the influence mobile technologies have played on e-learning in South Africa.

Affordable access to online info, access to .mobi learning sites,
Learning content created for access via internet
Access to learning communities to get advise

- 7.2 The participants will be using social networking. (4)

Create a list of four rules to be considered when posting on content on social media.

If you won't post it on a billboard – don't post online
Once out there – it is impossible to remove
Do not allow geotagging on videos and images
Control privacy settings
.... Anything reasonable

- 7.3 The High School Hacker Society would need users to sign an Acceptable User Policy (AUP) before they can compete.

- 7.3.1 What is an AUP? (1)

Document ✓describing what users can do on the network. ✓
--

- 7.3.2 List two items you would put into an AUP and explain why you have included them for this scenario

(2)

Any two reasonable items with a justifiable reason.

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Question 8**Software development****38 Marks**

- 8.1 A new application is being developed to manage the teams.
You have been asked to create a Team class

(10)

Team objects will each have three fields namely:

- The team ID
- The team topic
- The team score (int)

The basic requirements of this class will be:

- A constructor method to initialise the team ID and topic fields.
- Accessor methods for the score field.
- Mutator method for the score field.
- A toString() method to neatly display the fields

You are required to draw a class diagram for the Team class according to the specification shown above. Use the space provided in the grid below for your answer. You should make appropriate selections for your field types. Include appropriate details for each method header.

Team
- String teamID - String topic - int score ✓ private ✓✓ correct types
+ Constructor (String teamID, String Topic) ✓ Name ✓✓ parameters + getScore () : int ✓ + setScore (int score) ✓ + toString() : String ✓ ✓ all methods public

- 8.2 In the new application you make use of an array of team objects using the following declaration:

```
Team teamsArr [] = new Team [50];  
int size = 0;
```

- 8.2.1 What is the purpose of the size field? (1)

To keep track of elements as they are added to the array

- 8.2.2 Write an algorithm for a method called **findTeam**, which will accept a String parameter for the **teamID** and perform a sequential search through **teamsArr**, **terminating when the team is found**. The method should return the position of the team in the array if the item is found or -1 if the item is not found. (10)

```
public int findTeam✓ (String teamID) ✓  
  
pos ← -1 ✓  
loop ← 0  
while (pos = -1 OR loop < size) ✓✓  
    if teamID = teamID at teamsArr[loop] ✓✓  
        pos ← loop✓  
    loop ← loop + 1✓  
  
endwhile✓  
return pos✓
```

8.3 An array called **arrNumbers** is populated with the following 5 values

8	5	3	12	2
---	---	---	----	---

Another array called **arrTemp** is an empty array that can store 5 values.

The algorithm below extracts specific data from **arrNumbers** and stores the extracted data in **arrTemp**.

1.	int size $\leftarrow$ 0
2	loop x from 0 to length (arrNumbers)
3	if arrNumbers[x] modulus 4 = 0
4	arrTemp[size] = arrNumbers[x]
5	end loop

8.3.1 Complete the trace table below to show the contents of arrTemp.

(11)

line no	size	x	x < length?	arrNums[x] mod 4 = 0	arrT[0]	arrT[1]	arrT[2]	arrT[3]	arrT[4]
1	0								
2		0	T						
3				T					
4					8	✓			
2		1	T						
3				F					
2		2	T						
3				F					
2		3	T						
3				T					
4					12	✓			
2		4	T						
3				F					
5									
	✓	✓	✓	✓					
	✓	✓	✓	✓					
				✓					

8.3.3

The final result is incorrect. Can you identify the error in the algorithm and suggest how to rectify it. (3)

Size not increased therefore overwriting array element 0

```
if arrNumbers[x] modulus 4 =0
    arrTemp[size] = arrNumbers[x]
    size ++
endif
```

8.4 The application database has been set up using MS Access.

8.4.1 Name 2 advantages of using a database management system (DBMS). (2)

Centralization of data

Standardization of data

Able to extract(query) data for reporting

8.4.2 Give the name of a DBMS that you have used. (1)

MySQL

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