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Question 1 Terminology**[20]**

Define the following terms. Do NOT expand the acronym. 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 Northbridge (2)

Part of chipset ✓ connects faster ✓ components

1.2. IMAP (2)

Email protocol ✓ where mails are not deleted ✓ from server – available for many devices

1.3 Lossy Compression (2)

Reducing files ✓ where the original quality is lost ✓

1.4 Clock Multiplication (2)

Factor ✓ by which a component multiplies the system clock ✓ to get its own speed

1.5 Parity (2)

9th bit ✓ inserted to detect errors in the first 8 ✓ – error detection

1.6 Social Engineering (2)

Manipulation ✓ of people to reveal their private data ✓

1.7 Proxy Server (2)

Caches ✓ web pages in a network ✓ to increase download speed

1.8 Ransomware (2)

Software sent to a user that denies access ✓ to a service for a sum of money ✓ – e.g. encrypts files or attacks a web site

1.9 NAS (2)

Storage device ✓ on a network ✓ for vast volumes of data with an IP address

1.10 Client-side scripting

(2)

Processing✓ in a remote web browser✓ such as a calculator – does not need to connect with the server

Scenario

The Gift Box Project collects and distributes gifts at Christmas time to underprivileged children throughout South Africa and Namibia. The organisation makes efficient use of technology to ensure that the gifts that are pledged are collected and reach the intended recipients timeously.

The drop off points are manned by volunteers who require a laptop and internet access. Each drop off point is supplied with a handheld scanner.

Question 2 Hardware**[12]**

- 2.1 For volunteers who need advice on acquiring a device, the organization provides the following recommended specifications for an entry level laptop.
- 2.1 The CPU has a **Quad-Core** processor. Explain the term quad core. (1)
 The processor has 4 individual cores✓
- 2.2 The laptop is advertised as having 4GB of RAM (Primary memory) and a 500 GB HDD (Secondary memory).
- 2.2.1 Briefly explain the purpose of primary memory. (2)
 Primary memory holds data and programs✓ currently being used✓
- 2.2.2 Explain why it is necessary to have so much more secondary memory compared to primary memory? (2)
 Secondary memory holds all data and storage✓ whether they are being used or not. ✓
- 2.3 In a review on the laptop the reviewer states: (2)
As for RAM capacity, 4GB is enough for normal day-to-day multitasking.
 Explain what is meant by “normal day-to-day multitasking”.

Having a few tasks running simultaneously. ✓ Eg mail and browsing. ✓✓
But not heavy usage eg games, video editing.

- 2.4 One of the upgrade options would be to replace the **500GB HDD** drive with a **Solid State Drive**: (2)

Give ONE advantage and ONE disadvantage to replacing the HDD with a SSD.

Adv :Drastically boost program loading and file operations speeds. ✓
Disadvantage : smaller capacity – cost per GB more expensive✓

- 2.5 The laptop does NOT have a LAN Ethernet point. (2)
Explain the impact of this on the user.

Will not be able to connect to a LAN via a cable. ✓ Will need to rely on WLAN✓

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

Digital interface connecting Digital and Audio in a single cable – Link to DVD player

Question 3 Software**[21]**

- 3.1. List TWO functions the operating system must achieve for process management. (2)
- 1
- Ensure process gets CPU time ✓
Ensure process gets other resources it needs ✓
Ensure CPU is being used efficiently
- 3.1.2 Explain what virtual memory is and how it is used. (2)
- Area on HDD allocated to OS to use as overflow area for RAM. ✓
Pages are swapped between RAM and VM when extra space in memory is required. ✓
- 3.2 The BIOS is still required in a computer system today. Motivate the need for the BIOS by stating two important tasks that it performs.
- 3.2.1 Many students confuse BIOS with CMOS. Define BIOS (2)
- BIOS
- Performs hardware test at start up ✓
 - Loads the OS at startup ✓
 - It is essential for starting up the computer
- 3.2.2 Explain how CMOS and BIOS are used during the Power On Self Test (POST). (2)
- BIOS uses data ✓ from CMOS to run the tests to check the installed devices. ✓
- 3.3 The management are investigating having a mobile app developed to be used by the volunteers at the collection centres.
- 3.3.1 Explain why they would need different versions of the application for different operating systems. (2)
- Each OS supports different architectures ✓ and has different ways of interfacing with the SW ✓ (APIs), thus require their own version of the SW.
- 3.3.2 Name two mobile operating systems they would need to support. (2)
- Android ✓
iOS ✓

3.4 The app may be developed using C++ or Java.

3.4.1 Java is a language that is both compiled and interpreted. (2)
Explain why this is true.

Java is compiled to bytecode✓ and then interpreted for the native machine✓

3.4.2 Briefly describe an advantage of using Java in this scenario. (2)

Don't need to worry about underlying architecture. ✓ This is handled by the VM. Different VM for each OS✓

3.5 Mobile technologies are almost indispensable because they have the ability to connect to the web, interact with businesses and access information anywhere, anytime.

3.5.1 Using the scenario give an example of data and information. (2)

Data - Number on the barcode
Information – when linked to the system will give details of recipient.

Question 4 Networks

[21]

The Gift Box Project have a small head-office in Cape Town with printers, PCs and tablets. They employ 4 permanent staff, however need flexibility for extra staff who assist over the busy period from September.

4.1 Give two different examples why connecting the computers in a network would be of benefit to the project. (2)

1. share hardware resources - storage / printers
2. Security – control users and access to data

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

4.2.1 Give two advantages of having a file server in the network. (2)

Can centralise data storage
Centralise/ control users and privileges
Backups can be performed centrally

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

Size of memory ✓

Speed and performance of CPU ✓
Amount of storage space

4.3 Wired and wireless LANs are installed at the head-office.

4.3.1 Name ONE negative aspect of using a WLAN. (1)

Connection not as fast.

Less secure

Limited range

4.3.2 State one advantage of using UTP cables other than cost. (1)

Easy to install, don't need expertise to install

4.3.3 What device is needed to connect UTP cabled devices to the server in a star topology? (1)

switch

4.3.4 As wireless connectivity is provided. what would be the best wireless security protocol to use? Justify your answer. (2)

WPA 2 ✓ – more secure than WPA ✓

4.4 The LAN will be making use of Ethernet technology.

4.4.1 Name two features of ethernet technology. (2)

Star topology, UTP cabling, CSMA/CD ✓✓

4.5 Why is it advisable for the company to have a firewall installed? (2)

Briefly describe TWO reasons.

It prevents unauthorised access to the NW and servers from outside the company. ✓

Communication from SW inside the company to external sources is monitored / restricted. ✓

4.6 It is important for the head-office to have access to the internet.

They have an ADSL line and have chosen their ISP.

4.6.1 What device would be required to connect the LAN to the internet? (1)

Router ✓

4.7 The company's database was planned and created by a consultant. The consultant has explained that the data base security is guaranteed as the server has RAID disks and the database is backed up daily. (4)

Explain the difference between RAID and backups and how they work together to ensure that the data is secure.

RAID – configuration of multiple disks that protects data from hardware failure as data is shared between the disks. ✓

Backup – makes a copy of the data. ✓

If all hard drives crash / fire ✓ data can be recovered from backup ✓

4.8 At the collection centres the volunteers use wireless scanners that connect to their laptops, creating a PAN. Considering that the collection centres may not have access to a WLAN answer the following questions.

4.8.1 What technology would be used to create a PAN? (1)

Bluetooth ✓

4.8.2 What technology would the volunteer use to connect to the internet? (1)

3G/ LTE cellular technology ✓

4.8.3 Explain how they would achieve this. (2)

Could set up a hotspot ✓ with their phone and access the internet via the hotspot. ✓

OR

Purchase a 3G modem ✓ that they can connect to their laptop via USB ✓

Question 5 e_Communication and security**[19]**

5.1 The Gift Box Project website is an important interface for the company. Websites can be categorised as static or dynamic.

5.1.1 What do we mean when we say a website is static? (1)

Information does not change therefore every viewer sees the same information. ✓ Can only be changed by the webmaster .

5.1.2 What is the essential difference between static and dynamic websites? (2)

Dynamic website content is customisable✓. User can control their view eg Facebook – have own profile
Static everyone sees the same details ✓

5.1.3 Name and describe two ways that web 2.0 features that would be useful on the Gift Box Project website. (2)

For donors – would be able to trace and get feedback on gifts.

Allow centres to be able to view online

Links to facebook and twitter to keep all intersted parties informed.

Anything reasonable..

5.2 It is the responsibility of the Gift Box Project to protect the data of all users who register on their website. (2)

Name and describe two measures the Gift Project can take to ensure that the users' data is safe.

Use HTTPS - secure version of HTTP that encrypts data being submitted by users. ✓

They will require an SSL certificate. ✓

5.3 As the Gift Project rely on the generosity of the public they feel they may be susceptible to **phishing** and **spoofing scams**.

5.3.1 Explain the difference between these two terms. (4)

Phishing – fake email sent that appears to come from a legitimate sources ✓that asks you for personal details, account nos. by following a link in the email. ✓

Spoofing – email address or header is altered ✓to make it look like it was sent from a different/legitimate source. ✓

- 5.3.2 What is the best measure the Gift Box Company can take to protect their users from these scams. (2)

Education – warnings on website and communications sent to the users. ✓✓

- 5.4 The database designer would like to make use of cookies on the website.

- 5.4.1 What is a cookie? (2)

Cookie small text file stores info generated by a website ✓and saved in a browser. ✓

- 5.4.2 Describe how The Gift project could make use of cookies. (2)

Use it to store info / preferences for the user so that when they revisit the site can display their preferences. ✓✓

Question 6 Social**[14]**

- 6.1 All staff at Gift Box Project need to sign an Acceptable User Policy (AUP). (4)

Describe TWO clauses that the Gift Box Project may include in their Acceptable User Policy.

- Internet access for business purpose – not to access games, inappropriate content
- Company has a right to monitor usage
- Access to client information in confidential and cannot be shared
- anything reasonable

- 6.2 The Gift Box Project would like to employ an IT person. They are confused about the skills sets required for the following IT jobs.

- Programmer
- Database analysts
- Web designer
- Project manager

- 6.2.1 Which type of person would you recommend would be of most use to The Gift Box Project? (1)

Any are valid

- 6.2.2 Describe three core skills for the person you have chosen in 6.2.1? (3)

Match to answer in 6.2.1

- 6.2.3 Explain how this person would be able to add value to the Gift Box Project? (2)

Reasonable description ✓

Applied to the scenario ✓

- 6.3 One of the effects of **Digitilisation** on the workplace is **mobile offices**.

- 6.3.1 Explain the concept of a mobile office? (1)

The worker does not need a permanent office to visit daily.

✓They can do their work as long as they have the correct equipment with them. Can be available anywhere , 24/7. ✓

6.3.2 What technologies are needed to set up a mobile office? (2)

Mobile device(s) laptop , tablet and / or mobile phone ✓
Access to the internet. ✓

6.3.3 How can the Gift Box project benefit from mobile offices for collections? (1)

Collection centres can be set up temporarily at collection time
eg in school hall / pop up store without any infrastructure cost ✓

Question 7 Software development

[41]

7.1 The APP is being designed using Object Oriented Principles.
Consider the UML diagram of the Child class below.

Child
- firstName : String - age : int - gender : char - centreNo : int
+ Child (inFirstName: String, inAge :int, inGender :char, inCentreNo : int) + setAge (inAge:int) + getCentreNo() : int + toString (): String

One of the characteristics of Object Oriented Programming is Encapsulation.

7.1.1 Describe encapsulation (1)

Binding the data with the code that manipulates it. ✓

7.1.2 What are the benefits of Encapsulation? (1)

It keeps the data and the code safe from external interference✓

7.1.3 How is this achieved in the Child class? (2)

Private variables✓ accessed via public methods✓

7.2 There are four different method types in the class above. Constructors, mutators, accessors and toString. (8)

For each method type explain the purpose and give an example in the Child class. Complete the table below. Reproduce this table in your answer book.

Method Type	Purpose	Example
Constructor	Called when object instantiated to give class variables initial values.	Child
Mutator	Used to update the value of an instance variable	setAge()
Accessor	Returns the value of the instance variable	getCentreNo()
toString	Overrides java toString. Returns properties /variable values of the class.	toString()

7.3 Write the Java Method header for this method : (2)

+ setAge (inAge:int)

public void✓ setAge(int inAge) ✓

7.4 The project's database has been set up in MS ACCESS

7.4.1 Name 2 advantages of using a DB management system (2)

Data centralised✓

Reduce inconsistencies✓

Easy reporting, sorting✓

7.4.2 Give an example of another DBMS (1)

mySQL✓, Oracle✓

7.5 The database has a table with the information for each centre.

ID	CentreName	CentreLocat	NumberOf	CentreType	Click to Add
1	Rays Of Hope	Gauteng	45	Orphanage	
2	Sunshine Kids	Natal	50	Orphanage	
3	Little Stars	Limpopo	50	Creche	
4	St Mary's	Gauteng	35	Orphanage	
5	Orange Junior	Gauteng	200	Primary School	
6	Sugar Boys	Natal	20	Creche	
*	(New)		0		

7.5.1 Using the data above determine the result of the following query? (4)

```
SELECT CentreLocation, count(*) AS NumberOfCentres
FROM tblCentre
GROUP BY CentreLocation
HAVING count(*) < 2;
```

CentreLocation	NumberOfCentres
Limpopo	1

Header correct ✓✓

Correct values returned ✓✓

7.5.2 Describe the function of the HAVING statement (2)

HAVING is used to filter values after they have been groups. ✓Only columns or expression in the group can be included in the HAVING clause's conditions✓

7.6 One of the field that users' enter when they are registering is the email address. (5)

The accepted format for an email address is :

<username>@<domain>.co.za

Write down 3 rules to validate the email address. For each rule, write

down the corresponding algorithm in pseudocode. The first row of the table contains an example.

Rule	Algorithm - Pseudocode
Example Email address cannot be a null string	if email = null then errorMessage ← "Email is empty" endif

- One mark for the rule and one mark for the correct algorithm
- Check for @ sign
- Split field into Username and domain
- Check the last 5 letters are **.co.za**
- Check username >= 1 characters in length
- Check domain >= 1 characters in length

7.7 Given the following array :

```
int [] age = new int [20];
```

7.7.1 Create an algorithm to search for a given integer stored in the array. You need to identify and display the position of the matching element. (7)

Display -1 if the element is not found.

Prompt the user for the number to search for.

You may use pseudocode or a flow chart to describe your algorithm.

Input num ✓ **initialise variables before loop**

Pos ← -1

Found ← false

while (loop < 20 and found = false) ✓✓

if (age [loop] = num) ✓

pos ← loop; ✓

found ← true✓

end if

end while

output pos✓

- 2 if for loop used

7.7.2 Explain why your search is efficient. (2)

terminates✓ when the integer is found✓

7.7.3 Name another search algorithm you could have used. (1)

Search all✓

- 7.8 Study the algorithm below that supposedly calculates and displays the average age.

The algorithm reads the ages from the keyboard as test data.

ageArr is an array with a maximum of 5 values to store the ages.

For testing purposes only 5 values are being used.

Line Number	Description
3	total = 0 average = 0
4	input age
5	loop 5 times
6	input age
7	ageArr [loop] $\leftarrow$ age
8	total $\leftarrow$ total + age
9	end loop
10	display average

- 7.8.1 Redraw the following diagram representing the **ageArr** in your answer book.

ageArr

--	--	--	--	--

Use the given algorithm and the following test data to populate **ageArr** in your answer book. (2)

Test data : 8,6,9,5,6

6	9	5	6	0
---	---	---	---	---

- 7.8.2 The array has been incorrectly populated because of an error occurring between lines 3 and 9. (2)

Explain how the algorithm must be changed in order to correct the error.

change input age at line 4 to age declaration age =0

OR

Remove line 4

- 7.8.3 Assuming that the error has been corrected and that the array (2)
has been populated with the following values:

ageArr

8	6	9	5	6
---	---	---	---	---

The following is displayed at line 10

0

Rewrite lines 10 onwards to display the correct average.

Additional statements may be required.

10 average ← line /5

11 display average