PECANWOOD

COLLEGE

Prepared for Life

INFORMATION TECHNOLOGY THEORY – GRADE 11

NAME: _____ **GRADE:** _____

DATE: 18 NOVEMBER 2022
EXAMINER: MR SC EILERTSEN
MODERATOR: MR C SEEWALD

MARKS: 140
TIME: 2,5 HOURS

INSTRUCTIONS:

1. This examination is made up of 21 pages including Addendum A
2. A non-programmable calculator may be used.
3. There are additional blank pages at the end of the examination.
4. For some questions (eg truth tables, pseudocode) it is suggested you use a dark pencil so that you can edit your work if necessary.
5. It is in your interests to write **neatly and clearly**. Please do not write too small.

Section A **Short Questions**

Question One

Match the term in column A with its definition in column B. Use the answer grid below for your answers. Write the letter next to the question number. There is more definition than terms.

	Column A		Column B
1.1	Browser	A	A signal sent to the OS indicating that a component needs the attention of the CPU.
1.2	MAC address	B	A duplicate copy of everything that can be copied over to a newly installed drive, if the existing drive fails.
1.3	Audit trail	C	Every time a website is accessed, a copy of the website is kept in the browser cache on the local hard drive.
1.4	File backup	D	A 32-bit numeric address that uniquely identifies a device on a network. This address can be static or dynamically allocated.
1.5	VOIP	E	When a real number is converted to an integer and therefore loses all its decimal (fractional) values.
1.6	Proxy server	F	The application program that serves as the on-ramp to the World Wide Web.
1.7	Array	G	A technology that allows you to make voice calls using a broadband Internet connection instead of an analog phone line.
1.8	Truncating	H	Resides in the firmware and is part of the startup sequence of a modern personal computer.
1.9	Cookie	I	A small text file created by a website that provides a way for the website to recognize you and keep track of your preferences.
1.10	UEFI	J	A duplicate copy of your work in case the original gets deleted, overwritten, or corrupted.
		K	A record of transactions in an information system that provides verification of the activities on the system.
		L	Also called a web cache. A shared store of previously downloaded web pages, images, music, videos etc. on the (web) server of an organization. If anyone visits a previously visited website, it will download from here first; this enhances overall performance.
		M	An ordered arrangement of data items.
		N	Provides a unique identifier that is assigned to the network card of a computer.

(10)

Ques	Ans	Ques	Ans	Ques	Ans	Ques	Ans	Ques	Ans
1.1		1.2		1.3		1.4		1.5	
1.6		1.7		1.8		1.9		1.10	

Section B **System Technologies**

Question Two

For each of the questions below, you need to select the **most correct answer** from the options provided. There is an answer grid at the bottom of each page. You must write your selected option under each question number in the grid.

2.1) The result set of the SQL query below would offer the user data or information?

```
SELECT firstName, lastName, specialGuest
FROM tblPlayers
WHERE Year(now () - Year(dateOfBirth) ) > 30 AND gender = 'male' OR
specialGuest = true;
```

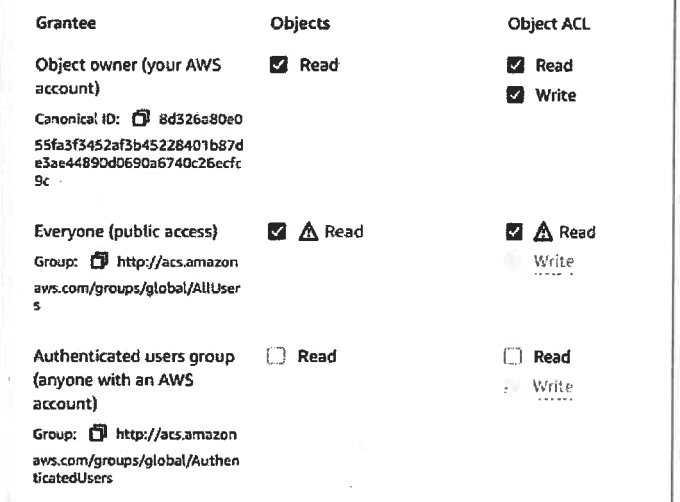
A) data
B) Information

2.2) For stored data to be useful it must be managed, maintained, organized, and controlled. Which **one** of the following in **not** part of managing data in secondary or cloud storage?

A) Creating user profiles B) Desktop management C) Deleting files D) Moving files E) Updating the OS F) Creating folders	G) Moving folders H) Backing up I) Archiving J) Compressing and decompressing files K) "Sharing" and "permissions" of files L) "Sharing" and "permissions" of folders

2.3) Study the image alongside. Does this show . . .

A) Archiving
B) "Sharing" and "permissions" of files and folders
C) Backing up
D) Desktop management
E) Compressing or decompressing files



Question	2.1	2.2	2.3
Answer			

2.4) There are 6 categories of memory, many have more than one name that can be used to reference them.

Which one of the following is **not** correctly organized from **fastest to slowest**?

A) Registers, On CPU chip cache memory, Off the CPU cache memory, RAM memory, Local secondary memory, Remote secondary memory

B) Cache memory L1, Cache memory L2, Cache memory L3

C) Primary memory, Secondary memory

D) Cache memory L1, Cache memory L2, Registers, RAM memory, Local secondary memory, Remote secondary memory

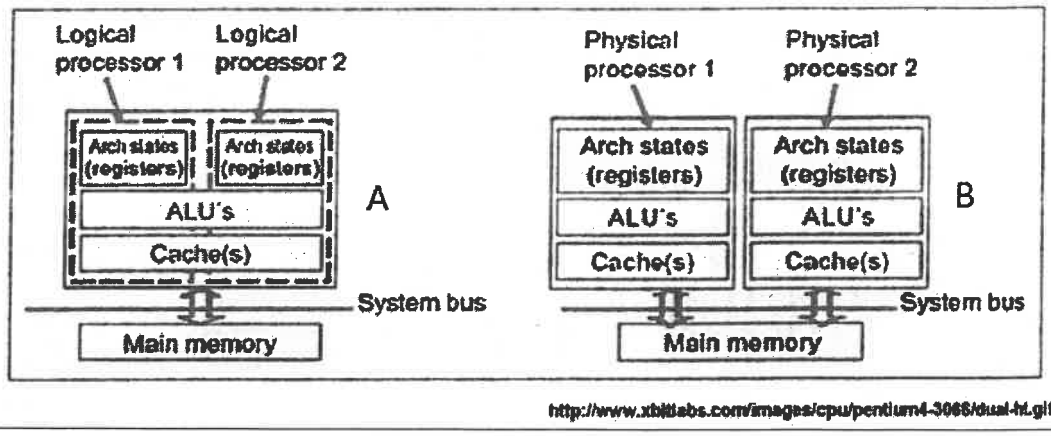
E) RAM memory, Local SSD, Local HDD, Cloud storage

2.5) We associate parallel processing with . . .

A) Hyperthreading
B) Multiprocessing

Question	**2.4**	**2.5**
Answer		

2.6) Study the image alongside and answer the questions that follow.



2.6.1) Which image illustrates a CPU designed for hyperthreading?
A) Image A
B) Image B
C) Neither of them
D) Both of them are capable of hyperthreading

2.6.2) Which image illustrates a CPU designed for true multiprocessing?
A) Image A
B) Image B
C) Neither of them
D) Both of them are capable of multiprocessing

2.6.3) Which image illustrates a CPU designed for multitasking?
A) Image A
B) Image B
C) Neither
D) Both of them are capable of multitasking

2.6.4) If the operating system has been designed for multithreading, and the application has been coded to allow multithreading – which image illustrates a CPU capable of multithreading?
A) Image A
B) Image B
C) Neither
D) Both of them are capable of multithreading

2.6.5) Which image could be used to illustrate the concept of virtual memory?
A) Image A
B) Image B
C) Neither of them illustrates virtual memory
D) Both of them illustrate virtual memory

Question	2.6.1	2.6.2	2.6.3	2.6.4	2.6.5
Answer					

(10)

Question 3 - Scenario - Woza

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

stats sa
Department:
Statistics South Africa
REPUBLIC OF SOUTH AFRICA

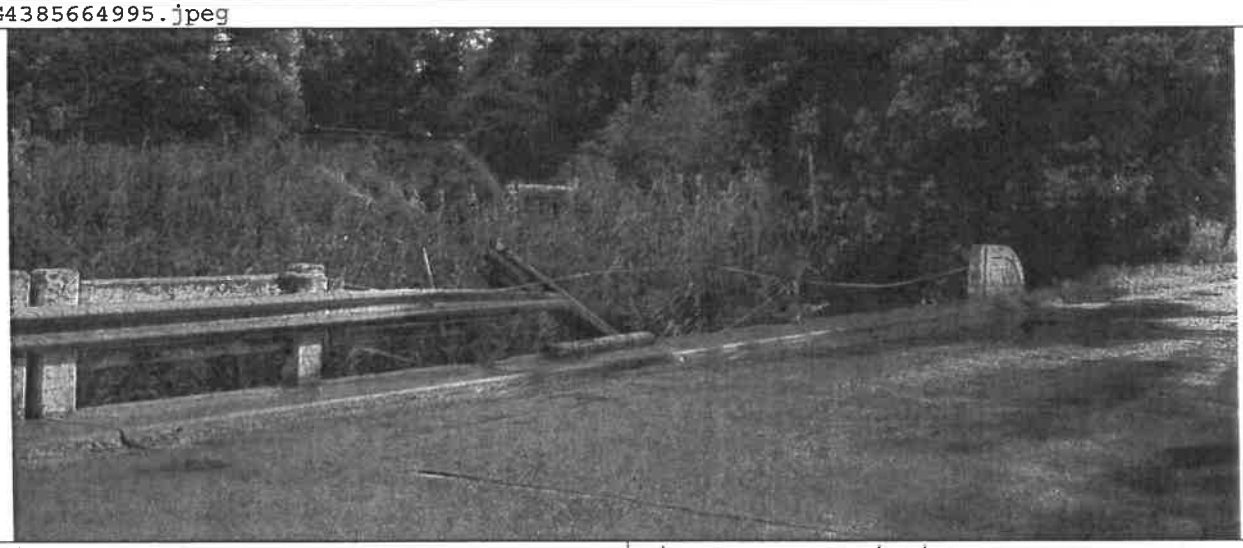
The Department of Statistics is finding itself increasingly under pressure i.e. merely counting people within each dwelling once every 5 years does not give the country the information it needs to plan for the next 20 years. It decides on a new two-pronged strategy i.e. "feet on the ground," combined with artificial intelligence (AI)

In a joint venture between the **Department of Higher Education and Training** and the **Department of Statistics,** students between the ages of 16 and 25 can apply for a free Android tablet with 5Gb free data per month. Using a web browser, they can get access to Ms Office online (Microsoft 365) a free lightweight online office suite offering a word processor, spreadsheet, presentation, mail, note taking and file hosting service – this is useful for their further academic studies. They can also access online study resources and aids.

Users are then able to earn more **free data** by uploading **high resolution** images to **cloud storage** taken in and around their environment using their tablet. Using AI these images are then analyzed, time-date stamped, categorized, prioritized, and linked to the GPS co-ordinates of where the photograph was taken; therefore, high-resolution images are preferred. Users must also add two keywords of their own to describe the image from a human point of view.

Using information harvested from the uploaded images the Department of Statistics can build a comprehensive, up-to-date profiles of existing infrastructures by area, dynamic population density, population movement, formal and informal trading nodes, events, fauna and flora, areas of pollution and many other items of interest and concern for various government departments. (see below).

IMG4385664995.jpeg



Device: 5646997HFBHTG Username: steve.eilertsen@gmail.com Password: ********** Infrastructure: bridge Status: damaged Priority score: 7	Time Date: 2022/11/13 17:06:45 GPS South: 25.87428 GPS East: 27.79742 User Keywords: broken, bridge

More free data can be earned by participating in the theme of the week e.g. sports grounds, animals, events, intersections, informal traders etc. Images from spontaneous events are also encouraged e.g. floods, accidents, riots, demonstrations etc also earn free data. Also important is the need for images far away from the big city centers and from **rural areas**.

Students can participate in this initiative by applying through their school, college, technicon or university. Once they have received their tablet via courier they can download the app called "**Woza**". Woza records the necessary data when and where the photograph is taken and uploads the image to the departments cloud storage. Images are uploaded immediately if an internet connection is available – if not, Woza will store the image and data for upload when connectivity is re-established. Late at night all the day's images on cloud storage are downloaded and stored locally on file servers within the department's buildings.

The new division of the Department of Statistics will be housed in a building in Pretoria (now called the "head office"). Permanent staff will be linked to a client server LAN in order to build and maintain the growing database of images.

AI professionals will be employed to constantly improve the image analysis software and create local, regional, and country-wide reports for government use. Once uploaded the images are the property of the Department of Statistics and cannot be accessed by the public as they are only used for analysis and the collection of statistical data.

Question 4 **Application**

4) All office computers with have UEFI and not legacy BIOS and CMOS. They will also have a hybrid secondary storage solution.

4.1) IT and network security at the head office is a priority as the images are not for public consumption. Rootkits and malware that install themselves during the bootup process are one major threat to head office computers.

4.1.1) Explain how UEFI is one precaution that can be taken to protect head office computers from rootkits

_____

_____ (2)

4.2) High resolution images are large files and therefore all head office computers are fitted standard with **8TB – 3.5 Inch SATA 6Gb/s 7200 RPM 256MB Cache** internal hard drives. It is suggested that all office computers should have hybrid secondary storage solution i.e. one HDD for data files and one SSD for the OS.

4.2.1) "The reason for the hybrid secondary storage solution above is that office computers cannot boot off an 8TD hard drive."

a) Comment on the reason give above, and **b) give an alternative explanation.** _____

_____

_____

_____

_____ (3)

4.3) The HDD is described as "8TB – 3.5 Inch **SATA** 6Gb/s 7200 RPM **256MB Cache** internal hard drive".

4.3.1) Explain what "SATA" above means. _____

_____

_____

_____ (3)

4.3.2) Explain what "256MB Cache" means, and how it assists overall performance of the computer.

_____

_____

_____ (3)

4.4) It is suggested that the 3.5 Inch SATA hard drive above be connected to the M.2 form factor on the motherboard, and then to use the NVMe bus interface as this will improve performance.

Comment on the suggestion above . _____

_____

_____

_____ (3)

4.5) A 32-bit address bus can address 2 to the power of 32 (2^{32}) individual address lines. (4294967296 individual addresses). Head office computers however have a 64-bit address bus.

4.5.1) How many individual addresses is this? You may give your answer using scientific notation.

_____ (1)

4.5.2) Are there enough addresses to a fully address the whole 8TB hard drive? _____ (1)

[16]

Section C Internet and Communication Technologies

Question 5

For each of the questions below, you need to select the **most correct answer** from the options provided. Use the answer grid at the bottom of each page.

5.1) The physical layout of a local area network is called . . .
A) Topology
B) Ethernet
C) Bounded media
D) Unbounded media

5.2) Which of the following is **not** part of network addressing in the local area network within the building?
A) IPv4
B) MAC Address
C) ARP
D) DNS

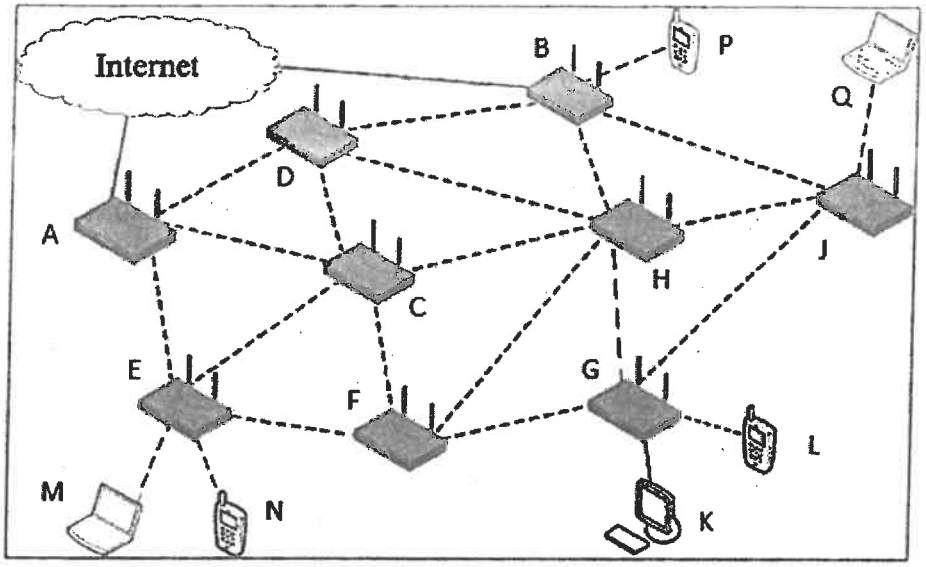
5.3) Which of the following is not a weakness of using copper cables in a network?
A) EMI
B) Eavesdropping
C) NIC
D) Attenuation
E) Crosstalk

5.4) Which of the following cannot be a node on a network . . .

A) Switch B) Laptop C) Smart phone D) Router	E) Keyboard F) Gateway G) Desk top computer H) Printer

Question	**5.1**	**5.2**	**5.3**	**5.4**
Answer				

5.5) Refer to the following image and then answer the questions that follow



http://washingtoncheapgallery2807.mx.tl/ -lan-diagram.html

5.5.1) We call the network topology . . .

A) Star B) Mesh C) Bus	D) Ring E) Ethernet

5.5.2) The devices labelled A and B are . . .

A) Hubs B) Routers C) Gateways	D) Bridges E) Switches

5.5.3) The devices labelled C, D, E, F are . . .

A) Hubs B) Routers C) Gateways	D) Bridges E) Switches

5.5.4) The device most likely to be a file server would be . . .

A) Device L B) Device K	C) Device G D) Device Q

5.5.4) The dotted lines would most likely represent . . .

A) UTP cable B) Fiber optic cable	C) Bounded media D) Unbounded media

Question	5.5.1	5.5.2	5.5.3	5.5.4	5.5.5
Answer					

(9)

Question 6 **Application**

6.1) Head office installs an **Ethernet** network laid out in a **star topology** using **UTP** cabling throughout with a **wireless hotspot** in the cafeteria area. **Switches** are installed into network cabinets which are secured in locked rooms throughout the building. **WiFi** is also available in the board room area and in various breakaway work rooms. The main **authentication server** has Microsoft Server 2022 installed. They also have Microsoft **Exchange Server** installed on a second server and a third server is used as a **print server**. They are forced to install two network **repeaters** to ensure a reliable network connection for every node. They install a powerful **file server** in a secure room to store the images downloaded from the **cloud** each day. Finally, they have a **supercomputer** that runs 24 hours a day analyzing images, labelling them, categorizing them, and saving them with relevant meta-tags. Once the **AI** is completed the labelled image is automatically moved onto the file server. Specialist technicians work at their workstations evaluating the work done by the AI software so that they can suggest improvements to the **algorithms.**

How would you fully explain this installation to someone who knew nothing about networks? Ensure that you focus on the words in bold

(15)

Question 7 **Internet and communications**

7.1) The supplied Android tablet comes pre-loaded with Microsoft 365 – the online version of Ms Office which is free for schools and students.

7.1.1) Explain why Microsoft 365 is a web-based app _____

_____ (2)

7.1.2) Give three advantages of a web-based app. _____

_____

_____

_____

_____ (3)

7.1.3) Which is the default browser for Android (comes pre-installed) _____ (1)

7.2) Woza is written specifically for tablets that use the Android OS and that use the default Android browser. Is Woza . . .

- A native mobile app
- A web-based mobile website
- A hybrid app

_____ (1)

7.3) When loaded Woza detects your location – is this a client-side script or a server-side script?

_____ (1)

7.4) When loaded Woza detects your location and makes suggestions of images it would like you to upload from that location. Is this functionality Web 1.0, 2.0 or 3.0?

_____ (1)

7.5) Once Woza knows your location it searches its database and then suggests images that it feels it is missing from its collection. Is this functionality a client-side script or a server-side script?

_____ (1)

7.6) Woza can search its database and detect whether an image is original or whether you have stolen it, downloaded it from the internet or uploaded it to Woza before. What do we call this type of search?

_____ (1)

7.7.1) The tablet does support streaming. What is streaming? _____

_____ (2)

7.7.2) Streaming is bandwidth intense. What would be the best way (affordable way) for a student to stream on this device?

_____

_____ (2)

7.8) Many students live and study far from home. How can the tablet be used to affordably allow them to stay in touch with family and friends back home?

_____

_____ (2)

7.9) The images taken by the tablet are jpg (jpeg). Is jpg lossy or lossless? _____ (1)

7.10) Explain the difference between lossy and lossless _____

_____

_____ (2)

7.11) All databases must have valid data. We use validation to check that data is valid, realistic, logical, and possible. For each of the following suggest a good validation check you could do for each of the datatypes. NOTE: To qualify for the 5 marks below you may not re-use the same answer more than once.

7.11.1) A living person's birthday _____

_____ (1)

7.11.2) A person's first name _____

_____ (1)

7.11.3) The name of the country where a person was born _____

_____ (1)

7.11.4) A person's passport number _____

_____ (1)

7.11.5) The date a person says they will do something e.g. paying back a loan _____

_____

_____ (1) [25]

Question 8 **Devices and connectivity**

8.1) It would be easier for the students to take the photos with a smart phone. Why did the department choose tablets for the job and not smart phones? Explain.

(3)

8.2) Study **addendum A** – Four tablet devices (one to four) and then re-study the scenario.

8.2.1) The department is considering 4 different tablet devices as shown on the addendum A. Refer to the individual specifications of each device and outline which device is **best suited** to the job – also explain tablet specifications that **do not match** the needs of the job at hand.

(10)

[13]

Section D **Data representations and Boolean expressions**

Question 9

9.1) Solve the following Boolean expressions using the values of A, B and C provided

					Substitution and workings			Ans
9.1.1	A = 0	B = 1	C = 1	**A.B.C**				
9.1.2	A = 1	B = 0	C = 1	**A+B+C**				
9.1.3	A = 0	B = 1	C = 0	**(ABC).(ABC)'**				
9.1.4	A = 0	B = 1	C = 1	**A+B.(C'B')'**				
9.1.4 cont								

(6)

9.2) In a computer game, the current scenario is 5 minutes before the Death Star blows the planet apart. There are not enough spaceships available to make an escape. The game will only allow you to board the escape craft under the following 3 conditions . . .

> Your character level is 10+, or your character has a charisma score of 12+, and your character must not have a prison record.

9.2.1) Using **function notation** write down the function using T (ten), C(charisma), P(prison record)

_____ (2)

9.2.2) Draw a **truth table** on one of the additional pages at the back of this examination paper. Show your substitution in its OWN COLUMN before you start solving or simplifying. (6)

9.2.3) How many outcomes will provide an escape from the doomed planet ? _____(2)

9.2.4) Express your findings using function notation _____ (2)

[18]

Question 10 **Solution development and trace tables**

Every image from Woza has a pair of GPS co-ordinates. The AI department is finding an error when the first six digits of the degrees south GPS co-ordinates are added together.

Example: GPS degrees south = 25.8742. 2+5+8+7+4+2 = 28. This is what the algorithm must do at this point. Here is the algorithm below. It does not add to 28. Instead, the program gives a NumberFormatException error message.

10.1) For error identification purposes create a **trace table** on one of the additional pages at the end of this exam showing the progression of the program from line 8 to the point of termination. (8)

```
 8        double south = 25.87428;
 9
10        String digit = null;
11        int totalDigits = 0;
12        String southTempString = "" + south; // convert double to string
13
14        for(int i = 0; i < 7; i++)
15        {
16              digit = southTempString.substring(i,i + 1);
17              totalDigits = totalDigits + Integer.parseInt(digit);
18        }
19
20        System.out.println(totalDigits);
```

10.2) Once you have found the error in the algorithm above (using the trace table) correct the algorithm in the space below using **Java**. (Due to the nature of the error, we are not going to use pseudocode for this exercise.)

(6)

10.3) When a student wants to take their first photo, they open Woza on their tablet and log in for the first time using the default password. Once successful they must be given the opportunity to change their password; the new password must be 10 characters long. If the password is too short, they must be prompted to insert a password of the correct length until they are successful.

The default password is password.

Using **pseudocode** write the algorithm above in the space below. Use pencil so that you can edit your work.

(10)
[24]

Grand Total: 140

Additional Paper 1: Please label your answers clearly

Addendum A: Four Tablet devices

	Device One	Device Two	Device Three	Device Four
Line	**Connectivity**	**Connectivity**	**Connectivity**	**Connectivity**
1	5G	Nil	4G (LTE)	Nil
2	WiFi built in	WiFi built in	WiFi built in	WiFi built in
3	Sim type Nano sim x 2	Sim type nil	Sim type Nano sim x 2	Sim type nil
4	Bluetooth	Bluetooth	Bluetooth	Bluetooth
5	USB Type C	USB Type C	USB Type C	USB Type C
6				
7	**OS**	**OS**	**OS**	**OS**
8	Android 11	Android 12	Android 11	Android 11
9				
10	**Battery**	**Battery**	**Battery**	**Battery**
11	5580mAh	7040mAh	6580mAh	5100mAh
12				
13	**Memory**	**Memory**	**Memory**	**Memory**
14	3GB	4GB	4GB	3GB
15				
16	**Storage**	**Storage**	**Storage**	**Storage**
17	32GB	64GB	64GB	32GB
18	Expandable to 128GB	Expandable to 1TB	Expandable to 128GB	Expandable to 1TB
19				
20	**Audio/microphone**	**Audio/microphone**	**Audio/microphone**	**Audio/microphone**
21	3,5mm AudioJack	3,5mm AudioJack	3,5mm AudioJack	3,5mm AudioJack
22	microphone - built in	microphone - built in	microphone - built in	microphone - built in
23				
24	**Camera**	**Camera**	**Camera**	**Camera**
25	Rear camera x 1 - 5MP	Rear camera x 1 - 8MP	Rear camera x 1 - 13MP	Rear camera x 1 - 8MP
26	Front camera x 1 - 2MP	Front camera x 1 - 5MP	Front camera x 1 - 5MP	Front camera x 1 - 2MP
27				
28	**Display**	**Display**	**Display**	**Display**
29	8 inch Touch screen	10 inch Touch screen	8 inch Touch screen	9 inch Touch screen
30	LCD	TFT	FHD	TFT
31				