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Q. No. 2 Part (I) **Key Aspects of Usability in System Design**

o) Effectiveness: The degree to which user can successfully complete the task using the device or system.

o) Efficiency: The speed & minimal effort to complete the task using device or system. It often refered as space & time complexity

o) Satisfaction: The comfort & user experience on using the device or system. Higher satisfaction means user can easily perform task or use system without any frustation.

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Q. No. 2 Part (II) **Security Protocol Importance:**

Security protocol are important to protect your information in todays digital world from attackers that may misuse your information & can damage your reputation or use your financial information.

Security protocol like Ipsec protect your information when using Internet. Also VPN ensure safe & secure browsing. These protocols add security layer to protect your information from being stolen.

Example:

Secure Socket layer (SSL) / Transport layer Security (TLS): These provide safe & secure communication between server & clients.

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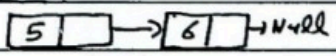
Q. No. 2 Part (iii) **Linked List** :-

Linked List is a type of structure which shows relation of one node (element) with another node using the concept of pointers (reference to next or previous node).

Advantages :

- The Linked List is dynamic. So, it means you don't have to fix the size of data at start.
- It is suitable for dynamic or changing data
- It can make relation of node (element) in single or transversal direction. Also, it can make relation of a node in a loop

Example :



Q. No. 2 Part (iv) **Importance of Learnability in HCI** :-

- Learnability makes sure that system is easy to learn or use for new users.
- Learnability makes sure they quickly adapt to the new system.
- If the system is easy to lean or use. It can increase the memorability of a system. It means the system will be easy to remember even we use after a long time.
- Without Learnability in HCI. User will find hard to use app & will find alternating apps that are easy to use.

Example :

Mobile Apps provide quick tutorial for new users to how to use the application.

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Q. No. 2 Part (v)

Symmetric Cryptography	Asymmetric Cryptography
◦) It uses a public key for encryption & required secret key in advance.	◦) It uses a public key for encryption & private key for decrypton. Therefore, it is no need for secret key.
◦) It is suitable for large amount of data	It is suitable for small amount of data
◦) It is less secure	It is most secure
◦) It is computationally fast	It is computationally slow because mathematical algorithms involved in it.

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Q. No. 2 Part (vi) **Data Normalization** :-

Data normalization is the process of removing redundancy & inconsistency in data making data unique & consistent.

Forms of Data Normalization :-

◦) First Normal Form (1NF) :

In 1NF the atomic values are removed. Also repeating groupings & atomic cells are also removed.

◦) Second Normal Form (2NF) :

IN 2NF it makes sure that all non-key attributes are dependent on whole primary key (uniquely identify record in a table)

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Q. No. 2 Part (vii) **Test-Train split in Model Building** :-

- Test-Train Split in Model building refers to spliting of a data for training & testing.
- The data used for training can't be use for testing. The testing is done for a new data.
- Therefore Test-Train Split in model building helps to train data for real world new problems.
- Training portion should always must be higher then testing portion. However if entire data is used for training it can lead to overfitting & if higher data is only used in testing it can lead to underfiting

Example : Model has to predict cat, dog & horse. The training data will be 70 percent & testing data will be 30 percent

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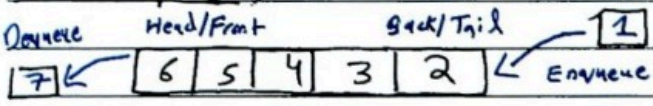
Q. No. 2 Part (viii) **Queue** :

Queue uses the FIFO (first in-first out) principle

Operations of Queue :

- Enqueue : It refers to adding of a new data from tail/back.
- Dequeue : It refers to removing of existing data from the head / Front.
- Front : It returns the first existing element without removing the element. It can return the first existing element after dequeue at front by not changing or removing the existing other elements.

Example :



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Q. No. 2 Part (ix) **Advantages of Array** :

o) Array is a simplest data structure that is suitable for static data & has continguous memory location means any element can be selected very fast.

Types of Array :

One-Dimensional Array (1D Array) :

In One-Dimensional Array elements are present in the form of one row & columns can be more then one according to data need.

1	2	3	4	8
0	1	2	3	4

The row doesn't have indexes.

Two-Dimensional Array (2D Array):

In 2D Array elements are in form of matrix & element can be called from indexes of row & column.

	0	1	2
0	1	8	3
1	2	9	10
2	16	5	7

Q. No. 2 Part (x) **Identity Theft** :

It refers to stealing of user identity in digital world for damaging the reputation of user or to steal their information for personal benefits.

Identity Theft Harmful Effect on User :-

Identity theft can damage the reputation of individual or buisness by using their names or information.

They can use your identity to blackmail you or demand for your personal or financial information for their own benefits.

They can also use your information to take loans from bank or perform transactions you don't even know.

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Q. No. 2 Part (xi) **Cipher in Cryptography:**

Ciphers are used in cryptography to encrypt data & it is only accessible to authorized user.

Cipher Method.

- **Ceaser Cipher:**

Ceaser Cipher is one of oldest cipher method. In which each letters is shifted by a fixed number of position in alphabet. Each shift has their fixed displacement of position in alphabet with one another. For example if from shift 3 the A will turn to E & B to F & so on.

Diagram:



Q. No. 2 Part (xii) **Digital Tools in Complex Research Topics:**

- Digital Tools can provide visuals such as images, presentations, videos & audios for complex research topics & make the topic engaging & easy to understand.
- Digitals tools can provide charts, graphs ~~or reports~~ for ~~reo~~ statistical data. Making statistical data easy to understand & easily know the cause & effect relationship b/w variables.
- Digital tools help explaining the research topic for non technical audience making the communication between audience & business owners or service providers easy.

Example: It company can provide graphs for statistical data & audio & videos for plain text data & visuals such as images for better understanding of research topic

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Q. No. 2 Part (xiii) **Blockchain** :-

Blockchain uses a leadger of databases to share or transmission of datan in a network. The leadger means continuously gowing records also knows as blocks. These blocks are chained together using cryptography. The ~~on~~ cryptography provides security to blockchain in a ~~newt~~ network as it encrypts data during transmission & make sure it is only accessible to authorized user. Hence providing security to blockchain network. It is used in digital currency also known as cryptocurrency.

Application of Blockchain :

a) Healthcare Sectors & Banking system :

Blockchain network makes sure that the customer data is unaltered during tranmission. As customers/patients information is critical they uses blockchain network to store & secure their datain different servers.

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Q. No. 2 Part (xiv) **Method for Improving HCI** :

a) Accessibility : The system should be designed inclusive. The system should be designed in a way that people with any disability or impairment can use the app efficiently & easily. System should provide flexible or adaptable ways to use the system. Such as people can customize the system according to their need. Visual Impairment user can able to Zoom In or Out the text. Also the system should have high crontrast b/w background & Text. It should also provide closed captions or transcript for people with hearing impairment. Hence accessibility can increase the number of users & satisfaction of system.

Example.

Youtube ~~videos~~ provide closed captions or subtitles for their videos.

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Q. No. 3 (Page 1) **Human-Computer Interaction (HCI) :-**

Human-Computer Interaction (HCI) defines a way ~~can~~ human can interact with computer efficient & effectively.

Common Problems in HCI :-

a) Accessibility / Performance Issue,

Many designers when making a system doesn't focus on users with disabilities which can effect accessibility issue. It will hard for visual impairment, hearing impairment or people with disabilities to use the application. It can decrease the number of potential users & they will be shifted to accessible system. Also if the system also have performance issue such that it gives error & doesn't maintain uptime or crashes instantly when using the app it can lead to poor satisfaction of user. Making it more less accessible to user with no disabilities

Example :

Consider a mobile food order website made by focusing only on users with no disabilities. When people with disability such as ~~a~~ those who have low vision or blindness it will be very hard for them to order a food as website might have low contrast ~~& also~~ and no zooming function. Also it doesn't provide screen reader for people with hearing impairement. Hence, it can result in loss of potential users. If the system also

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Q. No. 3 (Page 2) have performance issue such as it is crashes or can't maintain uptime. It will loose users with no disabilities.

o) Learnability / Memorability :
System should be simple & easy to learn for new user. However if the system is complex & overloaded with features it will be hard for the user to use the app & it can increase the frustation & user will shift to another application that is easy to learn or use. Some application might need quick tutorial for better usage & if your app doesn't have tutorial for app user will take time to efficiently use the app. However if the app is hard to learn it will resultantly will be harder to remember how to use the app after some time. Hence learnability can able to directly effect the memorability of a system.

Example :
Consider a video editing app for new editors. If the app is overwhelmed with too many functions & basic functions such as cut, copy or trim are harder to learn. It will result in poor satisfaction of user & user will shift to alternate video editing app. Also, if the system is harder to learn it will be harder to remember after some time.

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Q. No. 4 (Page 1) **Tree Transversal** :-

Tree transversal method is a systematic way to visit tree in specific order. Each tree transversal method has its own property. Some of tree transversal methods are given below:

Pre-Order Transversal :-

a) In pre-order transversal method it follows the following order:

1) ~~Transverse~~ Visit the Root Node
2) Transverse the Left Subtree
3) Transverse the Right Subtree.

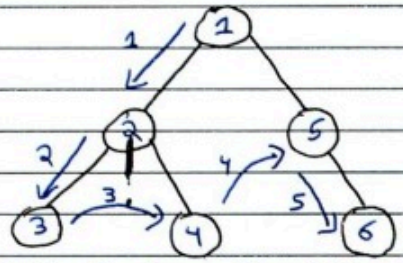
Example:

Consider (BST): 1, 2, 4, 3, 6, 5

After pre-order tranversal it will be sorted in ascending order

1 → 2 → 3 → 4 → 5 → 6

Diagram:



where 1 is Root node 2 & 5 is parent node 3 & 4 & 6 is child node.

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Post-Order Transversal :

a) In post-order transversal it follows the following order

1) Visit the Left subtree
2) Visit/Transverse the Right subtree
3) Visit the Root Node.

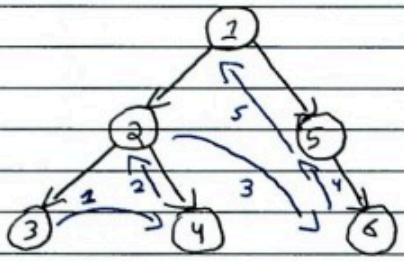
Example :

Conside a (BST) : 1, 2, 4, 3, 6, 5

It follows the following order :

3 → 4 → 2 → 6 → 5 → 1

Diagram :



where 1 is Root Node 2, 5 are parent node & their child node are 3, 4 & 6

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Q. No. 4 (Page 3)

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Q. No. 5 (Page 1)

Functional Programming :-

Functional Programming is a "programming paradigm", that describes how programs execution. It focus on what to achieve in a program rather than how to execute a program. Functional Programming uses functions to write a program & achieve desire result. Functions can be pre defined or user-defined.

Pros of Functional Programming

Distributed Denial of Service (DDoS):

Distributed denial of service (DDoS) is a type of cyber attack. In which attacker floods the user computer with unsual traffic. Unsual traffic can crash the system of user. These traffic can have harmful links which can lead to Identity theft or stealing of user personal information.

DDoS in business Organizations :

o) DDoS can load the server of business organization with unsual traffic which can break the serze & can result in downtime of a system.

o) If organization doesn't have another server in which the system or information is present. Then the company will lost the customer data forever.

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Q. No. 5 (Page 2) Example :

DDoS in business organization can crash the system for damaging the reputation of organization. Therefore companies need to backup the customer data on another server. DDos can happen when opening malicious websites or links

Ransomware Effect on Individual :

Ransoware can encrypt user data & demand for ransom (such as credit card information or money) to give user decryption key. However paying ransom doesn't mean your data will be given back completely.

Ransomware Effect in Business :

Ransomware in business can destroy the reputation in business or they can face serious financial loss. They can encrypt customer data & will blackmail the customer or business organization & will demand for ransom. However paying ransom doesn't sure business organizations will able to get their customer data completely which can create personal or financial problems for business & will make harder to trust business again.

Example.

Ransomware can lead to financial & personal loss for both business owners & individuals. The company will have serious backlash & customer will find harder to trust organization again. The individual or business organizations

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Q. No. 5 (Page 3) can face finqncial or ~~identifin~~ problem too.

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Q. No. 6 (Page 1)

Functional Programming:

Functional programming is a programming paradigm that defines or create a program using functions in a functional programming. It mainly have pre-defined/builtin function or user defined function in a Pythom. It mainly focus on "what" to achieve rather than "how" to execute a program.

Pros of Functional Programming	Cons of Functional Programming
◦) Code is simple to learn & easier to debug for the logic & errors.	Not easy for beginners. It need practice. Also code can be harder to debug for complex numbers.
◦) Functions are easy to made, understand and run. It also naturally supports parallel or concurrent programming & mainly focus on "what" to achieve rather than "how" to execute a progrm	Their are syntax to make functions but functions can make design complex if not used correctly. As it also don't support encapsulation or polymorphism. It is not suitable for real world objects or complex scenarios.

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