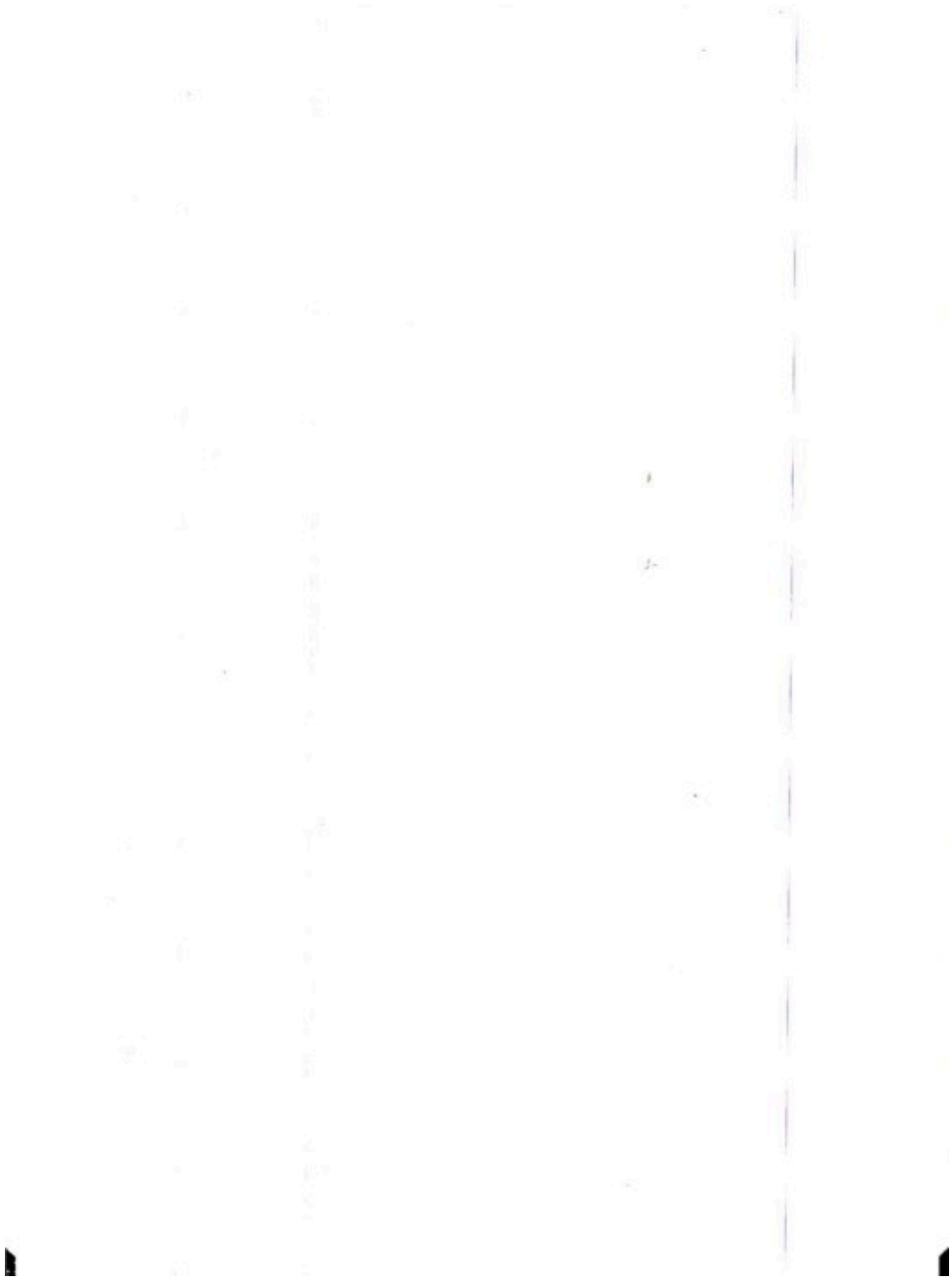
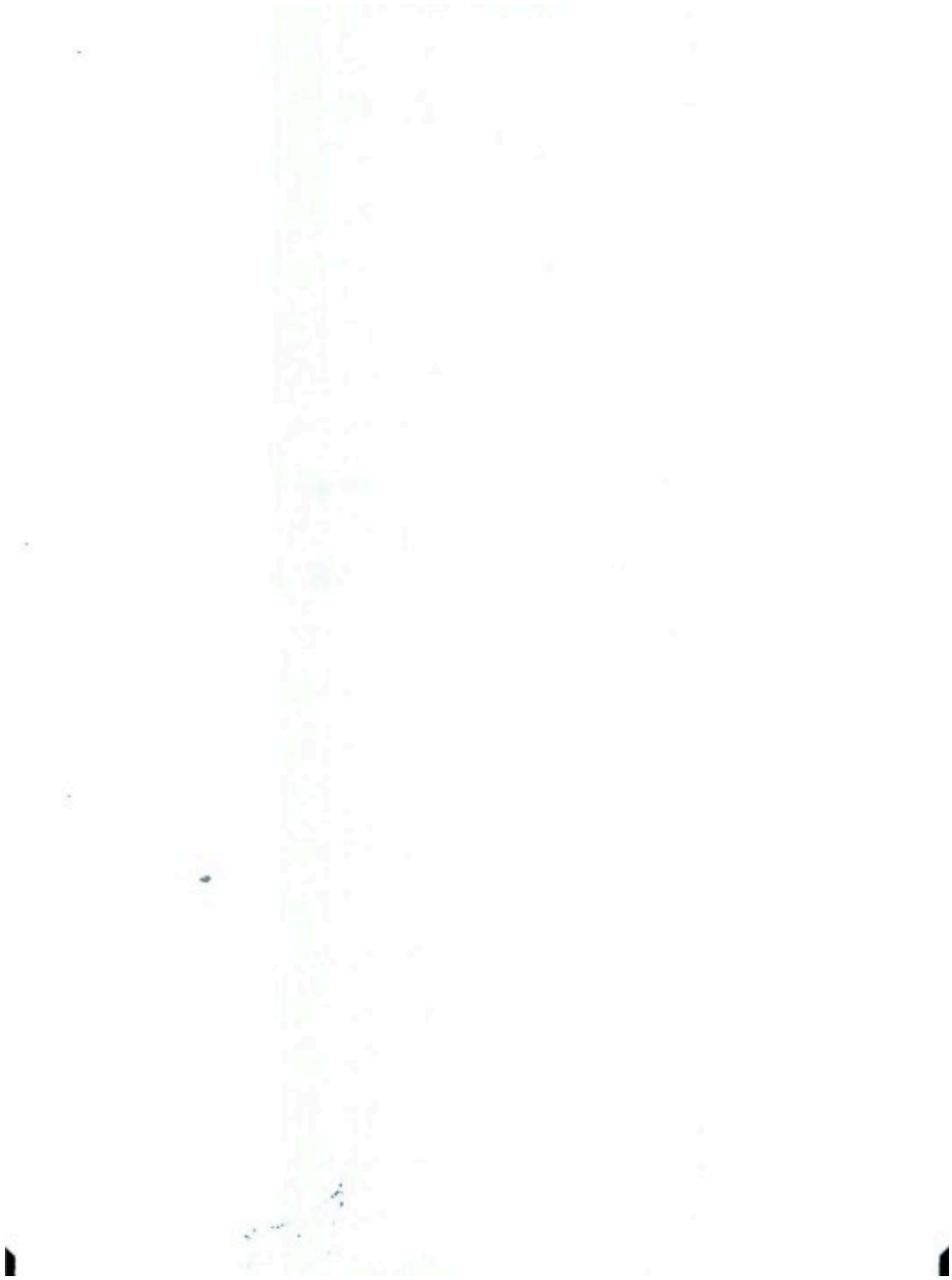






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Q. No. 2 Part (i) **Advantages of Machine learning:** Machine learning is the branch of AI concerned with implementing human intelligence in machin following are the advantages of Machine learning in modern technology,

1. Machine learning Models identify patterns and trends in the training data and hence make accurate predictions based on pattern recognition.
2. Machine learning Models are not explicitly programmed for a particular task, rather they train on a large training data set and slowly get better in identifying patterns and trends by adjusting weights and biase
3. Machine learning Models are extremely Fast, reliable and accurate if the training data is large. They can make accurate predictions, identify trends that even humans can't and have wide variety of application
4. Machine learning Models can be used to implement Deep learning, Neural Networks, Natural language processing etc and is used in Roboti
5. Machine learning Models accurately predict changing data Mathematic like analyzing weather patterns, rainfall etc.

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Q. No. 2 Part (ii) **Importance of Security protocols in Today's digital World:** following is the importance of security protocols in todays digital World,

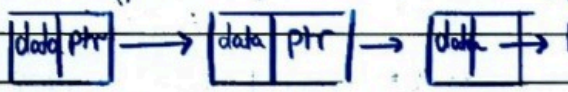
1. With the ever growing demand for technology the malicious users are also growing. example: They steal our personal data and compromise our privacy. This personal Information is the sold for profit. This is why implementing concrete security policies is crucial for enhancing security and safe guarding the Integrity of data.
2. Security Protocols like **HTTPS** (Hyper text tranfer Protocol) is used to encrypt the communication between the Browser and the webpage so that our sensitive information (credit card information, Name, age etc) are Not compromised. Other Security Protocols like **TLS and SSL** and **IPsec** are used to encrypt our information preventing unauthoris access.
3. Security protocols e protecte our digital footprint. **For Example:** Unsecure data transmission compromises our data and can be

(Section B)

Q. No. 2 Part (iii) **Linked List:** Linked list is a special datastructure in which data is stored in Non-contiguous memory locations and Each Node stores the data and the meta data, pointer to the next node (memory address). Example of singly linked list

Diagram:

(ptr means pointer)



Advantages of linked list: linked lists have their own advantages over standard arrays.

1. The deletion and insertion of data using linked lists is much faster and efficienct compared to arrays. This is because only the pointer value of a node needs to be changed instead of shifing.
2. linked lists are highly scalable and dynamic in size. Their size can easily be increased and decreased without extra Computational resources.

Q. No. 2 Part (iv) **Importance of learnability in HCI:** learnability is one of the most important principles of human-Computer Interaction. Learnability refers to how easy is to learn and understand the technology.

1. Smooth learning curve allows the user to easily understand the workings of a technology. This greatly enhances user retention.
2. A technology / software being difficult to understand and learn increases the cognitive stress and load on the user. This often leads to user frustration and can decline the user's attention span.
3. Implementing tutorials for first time users, giving them a demo walkthrough of the functioning of the technology greatly enhances user performance and understanding which enhances the functionality.
4. learnability is the breakthrough Factor which decides the long-term progress and growth of the technology.

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Q. No. 2 Part (v) (OR)

Symmetric Cryptography	Assymetric Cryptography
1. Symmetric cryptography is the encryption Method that uses only 1 Key for both encryption (encoding) and decryption (decoding)	1. Assymetric cryptography is the encryption method which uses 2 Keys Public Key for encryption, Private Key for decrypti
2. less safe because of the usage of only 1 Key and simple encryption.	2. More safe as it is Mathematically more advanced and requires complex Algorith
3. Applications: As symmetric cryptography is computationally less expensive it is used in simple encryption of data.	3. Applications: Assymetric encryptio is prefered when the data is very sensitive and it requires laige scale transmi
4. smaller Time complexity	4. laiger time complexity.
5. Requires the safe distribution of the Key (only 1 Key)	5. Doesnt require the safe distribution of Public Key but of the private Key

(vii) Wrongly attempted (vii) on (vi)

Q. No. 2 Part ~~(vi)~~ **Two-Factor Authentication (2FA):** 2FA is an Authentication Method that requires the user to enter 2 distinct information for proper authorization.

1. 2FA greatly increases the security and the confidentiality of the data. Authorization is not granted unless or untill the user gives 2 or Key Authenticating pieces of Information like, Password and OTP.
2. 2FA protects the integrity of the user data by making authorization almost impossible for unauthorized users. Even if the password is compromised, People with malicious intent can't gain access unless they are aware of another authenticating Information.
3. 2FA is implemented on almost all modern day applications social Media apps and even on login pages and desktop authorization. This makes unwanted access nearly impossible.
4. 2FA is easy to implement, protects data, enhances confidentiality and Makes our internet usage safe and secure.

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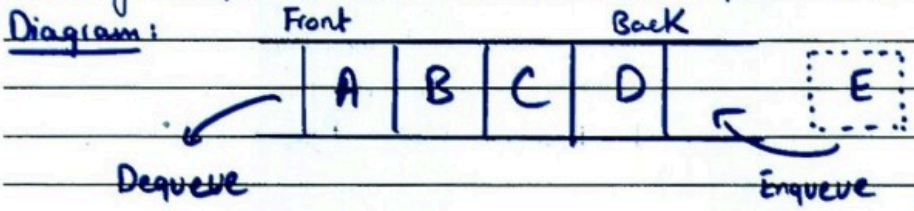
Q. No. 2 Part ~~(vii)~~ (vi) attempted part (vi) on (vii) by mistake.

time complexity	Space Complexity.
1. Refers to how the time of operations of the algorithms varies by input size.	1. refers to how the space occupied by the variables set if in the algorithm varies by the input size.
2. time complexity refers to the time of operations	2. space complexity refers to the size of data in variables.

(OR)

Q. No. 2 Part (viii) **Operations of Queue:** a Queue data structure works on the principle of **FIFO** (First in First out). Meaning the first element in the Queue is the first one out.

Diagram:



1. **Enque() operation:** This function adds another element in the back ~~(Rear)~~ of the queue. In the above example 'E' is added in the back.
2. **Dequeue() Operation:** This function removes the element from the Front (Head) of the queue. In the above example this removes 'A' from the queue. This operates on **FIFO**
3. **Front() operation:** this function returns the Front element

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Q. No. 2 Part (lx) **File I/O using python:** File input/output can be done in python by opening and closing of files.

→ **opening a file:** a file can be opened using the following statement,

```
file = open("file.txt", "r")
```

this opens the file in read mode.

→ **Closing a file:** a file can be closed by using the statement.

```
file.close()
```

Using the with statement:

```
with open("file.txt") as file:
    file.write("Hello World!")
```

This automatically opens and closes the file.

.....

Q. No. 2 Part (x) **A/B testing:** A/B testing is a type of useability testing in which 2 finalised versions of a website are created and they are then tested by the users. **Version A** and **version B** are extensively tested, user's performance is monitored and open ended questions are asked and finally the version with the most amount of Positive Feedback is choosen and implemented as the Final Product.

Useage of A/B testing to improve Website useability:

a Website development company can launch 2 versions of a website to be tested by the user and Find which version is more userfriendl

1. Users performance can be monitored on on both website to Find which version is better in reducing the time for making a purchase/transa
2. The themes, layouts designs and interface of Both versions can be compared simultaneously to check which one is more user friendly.
3. A/B testing can be used to check which version is more responsive performance

(Section B)

Q. No. 2 Part (xi) **Cipher Method used in cryptography:**

Cipher Methods are the special encryption algorithms that are used to convert plain data (Readable Form) into cipher data (unreadable Form). This makes the data hard to decode if compromised. Following are the common cipher Methods used,

(i) Substitution Cipher: Substitution Cipher works by substituting/replacing every letter in the plain text with another letter based on some format. For Example,

A	B	C	D	E	F	G	H	I	J	K	L	M
N	O	P	Q	R	S	T	U	V	W	X	Y	Z

the following Substitution Cipher is used. A→N, B→O ....

plain text: Hello **Cipher text using Substitution cipher:** URYYB

Q. No. 2 Part (xii) **Working of deeplearning in Robotics:**

deeplearning is a wide application of Machine learning used in Robotics,

1. Deeplearning Models are used to train robots for computer vision like analyzing and classifying objects, analyzing humans, analyzing the surrounding to make them aware.
2. Deep learning Models can be implemented in robots to generate Speech and talk just like humans. These Models are fed with huge training data of human speech, accent and language which they analyze and replicate, to speak just like humans.
3. Deeplearning Models are extensively used in Natural language processing (NLP) and language translation. This is then implemented inside robots to allow them to understand human speech and does automatic translations which removes the communication gap.
4. For Robots with specific Applications (Manufacturing, Agriculture etc) Robots are trained extensively to develop Pattern Recognition.

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Q. No. 2 Part (xiii) **Blockchain:** Blockchain is a decentralized technology that works through the distribution of a ledger (online database for recording transactions/information) to all the computers in the computer Network. Blockchain is **Decentralized** meaning everyone has shared control over it. Blockchain is very ~~fait~~ safe and secure because forging and tampering is Nearly impossible because of a shared record. The cryptogra digital ledger grows continuously and is made up of Blocks joined by



(joined using complex math algorithms)

Applications: Blockchain technology has wide variety of applications,

1. **Banking and Finance:** Used to safely encrypt Financial transactions.
2. **Healthcare:** Used to secure patient records and Medical information.
3. **Cryptocurrency:** Blockchain is most famous for online cryptocurrency like **Bitcoin, Ftherium** etc.

.....

(OR)

Q. No. 2 Part (xiv) **Accessibility for improving HCI:** (Human-Computer Interaction)

Accessibility refers to our technology / software being accessible and understandable to a wide diversity of people with abilities and disabilities like, **Visual and Auditory Impairements, Motor dysfunction etc.** It primarily focuses our technology / product being available and accessible to all sorts of people and attracting a wider Audience and range of people. **Example:** A website development Company has created an online E-commerce Store and they want to improve its accessibility. following are the functionality they wi

1. **Screen Readers and High Contrast Ratio:** for people suffering with low vision or permanent blindness, High contrast setting can be developed alongside screen Readers and Zoom in Feature for visual impairments.
2. **On screen Key Board and Voice over Feature:** for people suffering with motor impairments (loss of hand movement etc), voice over feature can be implemented to make the website controllable using voice. Alt text can be generated for images (**Red Woolen sweater**

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Q. No. 3 (Page 1) **Problems in Human Computer Interaction**

Human Computer Interaction (HCI) is the interaction between humans and computers and primarily focuses on enhancing usability, productivity and efficiency. Following are the problems associated with human computer Interaction which hinders user Experience.

1. **Lack of Accessibility:** Accessibility refers to our technology being accessible and understandable to a wide diversity of audience and people with dicabilities to improve the digital lack of accessibility means that our technology is not easily accessible by every person, which fails to attract a wide range of

Example: An online E commerce store is having problems in attracting a wider audience of people because of a lack of features to accomodate for users with visual and Audiotry impairments.

Solution: the online store should take the following steps to improve the accessibility,

(i) **Accessibility Features for Visually Impaired Individuals:**

for individuals that are visually imparced, zoom feature with the help of mouse must be implemented to view smaller texts and images. similarly, High contrast Mode setting needs to be developed to increases the color contrast and depth for the individuals that have low vision. Also, Screen Readers and voice over Feature needs to be implemented to ensure that the information is understandable by the users.

(ii). **Peformance issues:** Peformance issues are very frequent and common in HCI. This is because, many websites and applications are not optimised enough For low performance

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Q. No. 3 (Page 2) devices and also for the wide variety of devices that are available for media consumption.

Example: An online Bookstore noticed a decreasing retention and number of smart phone users.

Solution: Implementing a responsive layout for the website so that it works both on PC and mobile phones without any performance drops and issues Removing unecessary processes and background tasks that slows down the response time and leads to user frustration. This is why, prioritizing on performance is crucial for improving the user retention and enhancing productivity. The Bookstore should develop an interactive Nav bar to store related information and should reduce the unecessary back ground processes.

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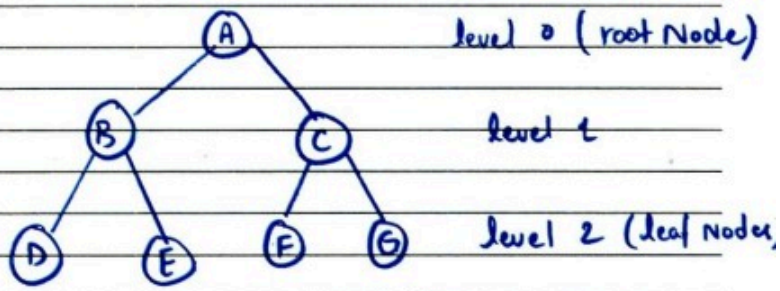
Q. No. 3 (Page 3)

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Q. No. 4 (Page 1) (OR)

Tree Traversal Methode: Tree traversal Methode are the Methods through which we traverse along a tree in a specific format. These are very important in various computing algorithms like DFS, BFS etc. following are the example of Post-order and Pre-order traversal Methods,

Tree:



Traversal using Pre-order Traversal: In pre-order traversal, the root node is the starting Node followed by the left sub-tree then the right subtree. following is the order,

(i) Root Node
(ii) Left Sub-tree
(iii) Right sub-tree.

Order of traversal: A → B → D → E → C → F → G

Explaination:

Meaning, you start at the first Root Node, (A) and traverse the left subtree going to B. Now you again traverse the left subtree, D then the right subtree E. After this's you traverse the main right subtree C then the left Node F followed by G.

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Q. No. 4 (Page 2) (ii) Traversal using Post-order Traversal:

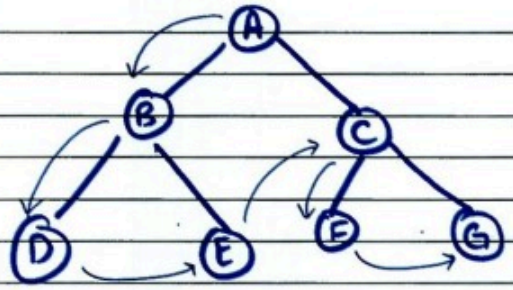
In the Post-order traversal of the tree, you first start at the left subtree, traverse it then to the right subtree, traverse it and finally, the root Node is reached at the end. The order of traversal is,

(i) Left Sub-tree
(ii) Right Sub-tree
(iii) Root Node.

Order of traversal: $D \rightarrow E \rightarrow B \rightarrow F \rightarrow G \rightarrow C \rightarrow A$

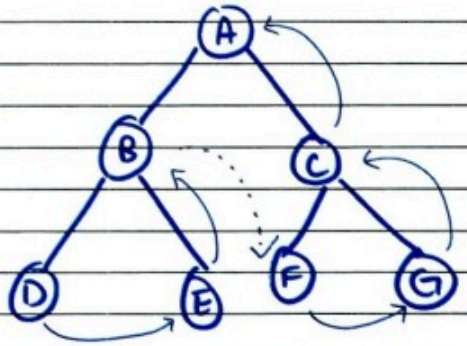
Explaination: We first start at the left most node of the left subtree (D), we traverse the right subtree (E) and then the parent Node (B). Similarly then F to G and then there parent node (C) and Finally, the root Node (A).

→ Tree diagram for Pre-order traversal:



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Q. No. 4 (Page 3) Tree diagram for post order traversal:



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Q. No. 5 (Page 1)

Functional Programming: Functional programming is a programming paradigm which uses functions to group and execute code. The Program is divided into

Internet of Things: (IOT)

Internet of things refers to the collection of physical devices connected through the internet and wirelessly communicate data

1. Application in traffic Management system:

1. Used for smooth and efficient rerouting of traffics.
2. Prevents road hazards and safety incidents.
3. CCTV cameras, and speed sensors can capture the images of the traffic rule violators.
4. Informs people of traffic congestion and hazards ahead of time.

2. Application in Health care sector:

1. Used for remote patient monitoring.
2. smart wrist bands and medical Equipments can monitor patient vitals reliably and accurately.
3. Iot based sensors are used in smart beds, ventillators and ambulances.
4. IOT based instruments are used extensively in surgery.

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Q. No. 5 (Page 2)

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Q. No. 5 (Page 3)

(Section C)

Q. No. 6 (Page 1) **Functional Programming:** Functional programmir is the programming paradigm in which functions are used to group code and execute instructions. The various processes and tasks are divided among various functions and these functions are then called any number of times to enhance productivity and increase code reuseability.

(i) Pros / advantages of Functional Programming:

1. the program uses functions to group the codes into related subtasks. This enhances the code reuseability factor because the function can be called any number of times.
2. Using functions is efficient because of Stack Memory.
3. The function can be called with different arguments and values which allows multiple outputs using the same code.
4. Using Functions greatly enhances code readability.

(ii) Cons / disadvantages of Functional programming:

1. Can often times lead to infinite recursion and overflow errors like, **Stack Overflow Error.**
2. Functional programming is difficult to implement and understand for the beginners that are new to programming.
3. Functional Programming is often undesireable when it comes to the development of large scale applications, games library management systems etc.
4. Complicated Functions can be difficult to debug and difficult to find errors especially with the added complexity of **Local and Global variables.**

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Q. No. 6 (Page 2)

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Q. No. 6 (Page 3)