

Chapter 1: Introduction

- i) What is Internet? Explain the importance of web technology?
[2080 Boardmarks]
 - The internet is a massive network of networks, a networking infrastructure.
 - It connects millions of computers together globally, forming a network in which any computer can communicate with any other computer as long as they are both connected to the internet.
- = Importance of web technology
 - i) Global Connectivity: Web technology allows people from all over the world to connect, share information and communicate instantly without regard to the geographical barrier.
 - ii) Access to information: It provides easy and instant access to vast amounts of information, enhancing learning, research and decision-making processes.
 - iii) Business Operation: Many businesses rely on web technology for their day-to-day operations, including communications, market-sales and providing convenience to customers.
 - iv) E-commerce: Web technology enables e-commerce, allowing businesses to sell products and services online.
 - v) Digital Marketing: It supports various digital marketing like SEO, content marketing, social media marketing and email marketing etc.

vi) Social Interaction: Platform built on web technologies facilitate social interaction and community building through social media.

vii) Education and E-learning: Online courses, and virtual classrooms powered by web technologies make education accessible to wider audience.

2) What is internet and web? Differentiate between web 1.0, web and web 3.0. [2079 Bhadra]

= The Internet

The internet is the massive network of networks, a network infrastructure

- It connects millions of network computers together globally forming a network in which any computers can communicate with any other computers as long as they are both connected to internet.

- Information that travels over the internet does so via a variety of languages known as protocols.

- Each computer connected in the internet are independent.

- There are variety of ways to access the internet

= The Web

- The World Wide Web (www) or simply the web, is a way of accessing information over the medium of the internet

- It is an information sharing model that is built on top of internet.

- The web uses the HTTP protocol, only, one of the languages spoken over the internet to transmit data.

- The web also utilizes 'web services' which use HTTP to allow applications to communicate, use the web to share information
- The web also utilizes browsers to access web documents/web pages that are linked to each other via hyperlinks

	Web 1.0	Web 2.0	Web 3.0
feature	Web 1.0	Web 2.0	Web 3.0
re. mod	1990s to early 2000s	Early 2000s till present	Emerging
content type	Static	Dynamic and user-generated	Semantic and decentralized
interaction	Read-only	Read-write	Read-write-rewire
language	HTML, Static web pages	HTML, CSS, JavaScript, AJAX etc	AI, ML, Blockchain etc
control	Centralized	Centralized but collaborative	Decentralized, user-controlled
flows	Information access	Community and collaboration	Personalization, intelligence
examples	Personal websites, directories etc	Social media, blogs etc	Blockchain based app, smart contracts etc

3) Ques

3) What is Internet and web? Explain the importance of web technology. [2078 Batches]

= Same as previous question

4) Explain how internet evolved. [2076 Chaitra]

= The evolution of internet can be summarized as:

i) Early development (1960s - 1980s)

- ARPANET: The Advanced Research Project Agency Network (ARPANET) developed in late 1960s for research and communication purpose.

- TCP/IP: In 1970s and 1980s; Transmission Control Protocol / Internet Protocol (TCP/IP) was developed for standardized communication across networks.

ii) Birth of web (1990s)

- www: The world wide web (www) invented by Tim Berners-Lee, introduced a system of interlinked hypertext documents accessed via hyperlinks over the internet.

- web 1.0: The early web (web 1.0) with features like static web pages and read-only content was introduced for information sharing.

iii) Rise of interactive web (2000s)

- web 2.0: Introduction of web 2.0 marked a shift towards dynamic user-generated content and increased interaction. Social media platforms, blogs and wikis became popular.

- Technologies: The use of technologies like AJAX, JavaScript, CSS etc enhanced the user experience, making web applications more responsive & interactive.

ii) The Intelligent Web (2010s - present)

- Web 3.0: Web 3.0 was introduced, which focuses on the intelligent, machine-readable data and decentralized systems. It aims to create more personalized and context-aware web experience.
- Decentralization: Emphasis on decentralized and user control over data with the use of blockchain-based applications and cryptocurrency.

S) Difference between the internet and www. Explain Client-Server paradigm and its importance.

The Internet	www
- A global network of interconnected computers	A system of interlinked hyperdocuments and multimedia across the internet
- Facilitates various types of data communication	- A web or www, is a way of accessing information over the medium of the internet
- Includes hardwares such as servers, routers, cables and protocols	Allows access to and interaction with web pages through browsers
- Started with ARPANET in late 1960s	Includes web pages, web browsers, websites, etc
	Invented by Tim Berners-Lee in 1991

Utilizes various protocols like TCP/UDP, SMTP, FTP, and HTTP/S Primarily uses HTTP/HTTPPS for accessing web contents

= Client - Server Paradigm.

~~Client~~

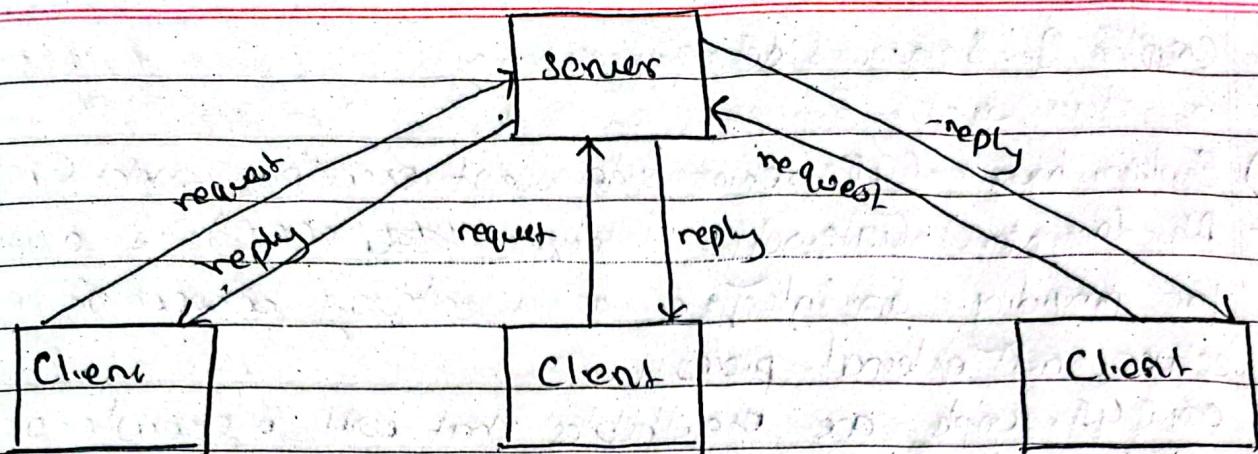
- A crucial paradigm for the internet is client-server paradigm.
- It consists of two types of programs:

- Client

- Client is an application program that runs on the local computer
- It is able to use the local computer for doing work
- When invoked by user, it initiates communication with computer
- It handles all the user interface issues
- The most common client is web browser.

- Server

- Servers are specialized programs that typically provide one service
 - It may handle multiple client requests simultaneously
 - It interacts with users in many sessions, both simultaneously and over long time periods
 - It waits for a request and ^{then} produces a reply.



Importance of Client server paradigm

This is the model the Internet and www is based upon so it is very important.

Cloud computing is all about moving applications from the local computing paradigm to client server paradigm.

Chapter 3 : Server-side programming

1) Explain how CGI server side script execution works (20% marks)

- The Common Gateway Interface (CGI) is a standard for providing an interface or a gateway between an information server and external process.
- CGI scripts are executable that will be executed on the server to produce dynamic and interactive web pages.
- CGI is most common on Unix or Linux servers.

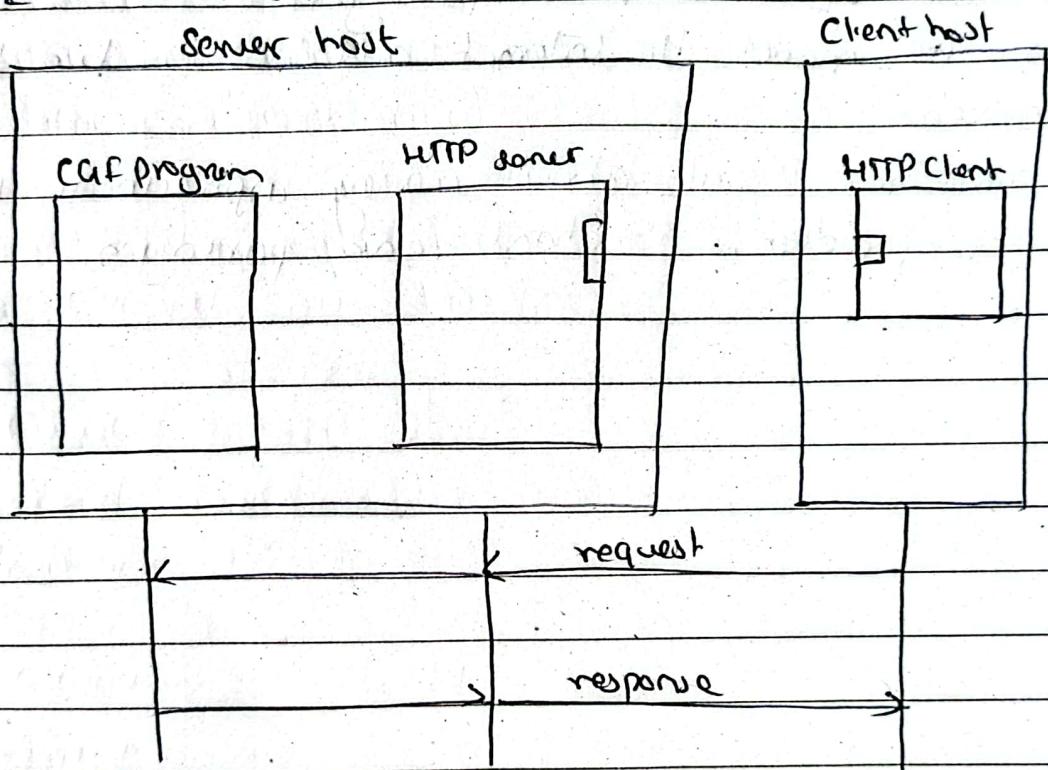


Figure 1: Working of CGI

- The browser sends a HTTP GET or POST command to the web server with the parameters, along with the path to the requested document which in this case is a CGI program, although the browser doesn't know or care about this.
- The web server notices that the requested document is a CGI program rather than HTML document.
- The web server initializes certain environment variables with

passes parameters, runs the CGI program in a newly-created OS process and the ~~CGI~~ CGI program in turn produces an HTML document as its output.

- The web server returns the generated HTML document to the browser passing along the header information as before

2) Difference between client-side scripting and server-side scripting. (2080 Batch)

Client-side scripting	Server-side scripting
- Needs only a browser to run	Requires server and services environment to compile and execute
- Application types are Animation, UI and visual elements, graphical design, games	Application types are databases, payment systems, emails, authentication, live data, AI, machine learning etc
- Common languages used in client side are HTML, CSS, javascript	Common languages used in server side are PHP, .NET, perl, Python, Java, Ruby etc
- It is fast but highly dependent on user's machine as all work is done on the client.	All work is done on the server thus is dependent on the machine itself.
- It can only do what browser let it do.	You can be very flexible in the server-side scripting.
- It has loose security	It can be secure.

3) Write the program to connect database and insert a data using server side scripting language [Assume database name "employee", table name "info" with column id, firstname, lastname, address, post and contact.]

db_connect.php

<?php

\$servername = "localhost";

\$username = "prudish";

\$password = "0920";

\$dbname = "employee";

\$conn = new mysqli(\$servername, \$username, \$password, \$dbname);

if (\$conn->connect_error)

& die("Connection failed: ". \$conn->connect_error);

?>

insert-data.php

<!DOCTYPE html>

<html lang="en">

<head>

<meta charset="UTF-8">

<title>Insert Employee Data </title>

</head>

<body>

<form action="insert-data.php" method="post">

```
<label for="firstname"> First Name: </label>
<input type="text" id="firstname" name="firstname"
required> <br> <br>
```

```
<label for="lastname"> Last Name: </label>
<input type="text" id="lastname" name="lastname"
required> <br> <br>
```

```
<label for="address"> Address: </label>
<input type="text" id="address" name="address"
required> <br> <br>
```

```
<label for="post"> Post: </label>
<input type="text" id="post" name="post" required>
<br> <br>
```

```
<label for="contact"> Contact: </label>
<input type="text" id="contact" name="contact"
required> <br> <br>
```

```
<input type="submit" value="Submit">
</form>
```

17.php

```
if ($_SERVER['REQUEST_METHOD'] == "POST")
    include 'db-connect.php';
```

```
$sql = "INSERT INTO info (firstname, lastname, address, post,
    contact) VALUES (?, ?, ?, ?, ?);"
```

```
$stmt = $conn->prepare($sql);
```

```
$stmt->bind_param ("ssss", $post['firstname'],  
$post['lastname'], $post['address'],  
$post['post'], $post['contact']);
```

```
if ($stmt->execute()) {
```

```
echo "New record created successfully";
```

```
y else {
```

```
echo "Error!: $stmt->error";
```

```
y
```

```
$stmt->close();
```

```
$conn->close();
```

```
y
```

```
?>
```

```
</body>
```

```
</html>
```

What do you mean by server side processing? Explain multi-tier architecture.

Server-side scripting is a web server technology in which a user's request is fulfilled by running a script directly on the web to generate dynamic web pages.

It is usually used to provide interactive websites that interface to databases or other data stores.

This is different from client-side scripting where scripts are run on the clients, usually in JavaScript.

The primary advantage of server-side scripting is the ability to highly customize the response based on the user's requirements, access rights, or queries into data stores.

- The server side scripting is done before a page is downloaded on the browser.
- PHP, ASP scripts are examples of server-side technologies.
- With server side scripting you can:
 - Dynamically edit, change or add any content of a web page.
 - Respond to user queries and form data.
 - Access databases and return the result to browser.
 - Access files and return the result to a browser.
 - Transform XML data into HTML data and return results to browser.

Chapter 8: Web applications:

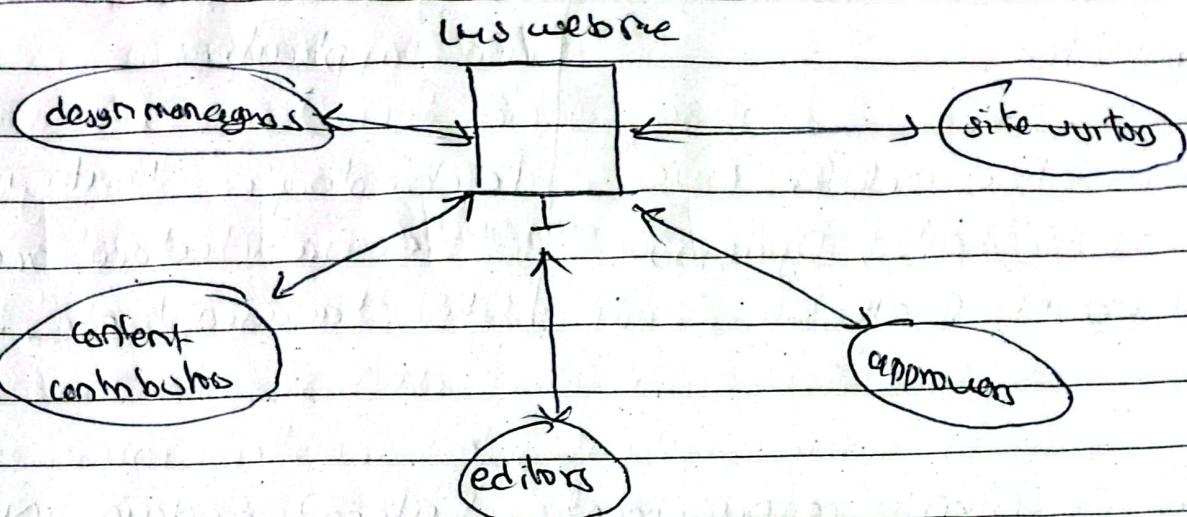
1) Difference between MVC and 3-tier architecture.

MVC	3-tier Architecture
- separates concerns	
- Its main purpose is to concerns in UI design for better manageability and testability	Its main purpose is to concerns across the application for maintainability and scalability
- It consists of 3 components <ul style="list-style-type: none">• Model: Manages data and business logic• View: Displays data to user• Controller: Handles user input and updates Model & View	Presentations [it also consists of] components: <ul style="list-style-type: none">• Presentation tier: User Interface layer• Application tier: Business logic• Data tier: Data storage and management layer.
- Focuses on structuring user interfaces by separating model , view and controller	Focuses on the overall application structure by separating presentation, application and data tier.
- The controller mediates between the model and the view processing the user inputs and updating model and view accordingly	The presentation tier sends user request to application tier which process them and interact with data tier as needed.

- Commonly used in web or UI application
- Used in enterprise and large scale applications
- Technologies that includes MVC are Ruby on Rails, Django, ASP.NET etc. MVC etc.
- Technologies that includes 3-tier architecture are HTML, CSS, Javascript etc., .NET etc

2) What is content management system? Explain information systems at different level of management.

- = Content Management System (CMS)
- A content management system (CMS) is an application that is used to manage web content, allowing multiple contributors to create, edit and publish.
- Content in a CMS is typically stored in a database and displayed in a presentation layer based on a set of templates.
- Basic features of a CMS are:
 - allows users to easily create and format content
 - stores content in one place, in a consistent fashion
 - assigns privileges and responsibilities based on roles such as authors, editors and admins
- Organizes and pushes content live
- A CMS typically has two major components:
 - A content management application (CMA), also front-end user interface that allows a user to add, modify and remove content from a website
 - A content delivery application (CDA) that compiles the content and updates the website.
- Wordpress is best example of popular CMS.



3) Distinguish between Content Management System (CMS) and web Application framework. Describe working of MVC architecture.

CMS

- Its main purpose is to manage, create and publish web content easily

- It is used by non-technical users who need to manage the website content

- It is user friendly with pre-built templates and plugins

- It is faster for setting up standard websites

WAF

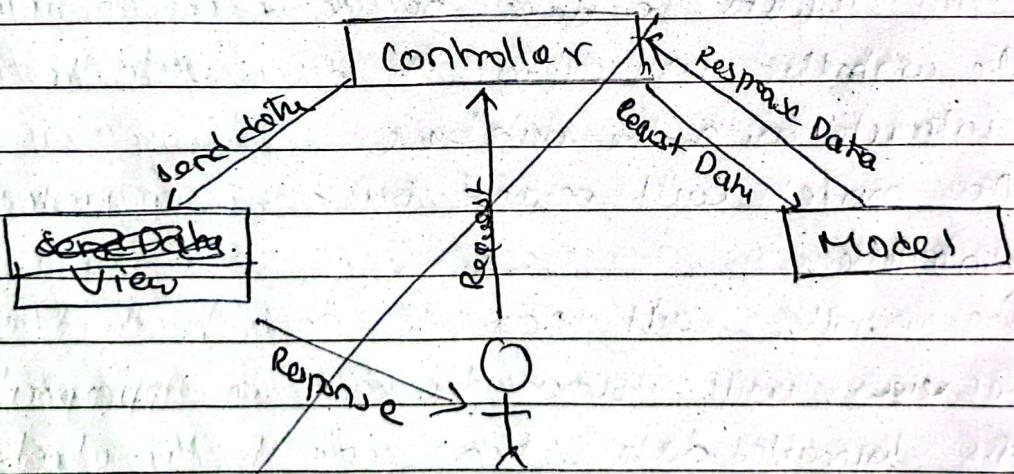
- Its main purpose is to provide a structure and set of tools for developing web applications from scratch

- It is used by developers who need flexibility and control over the application development process.

- It requires programming knowledge and setup.

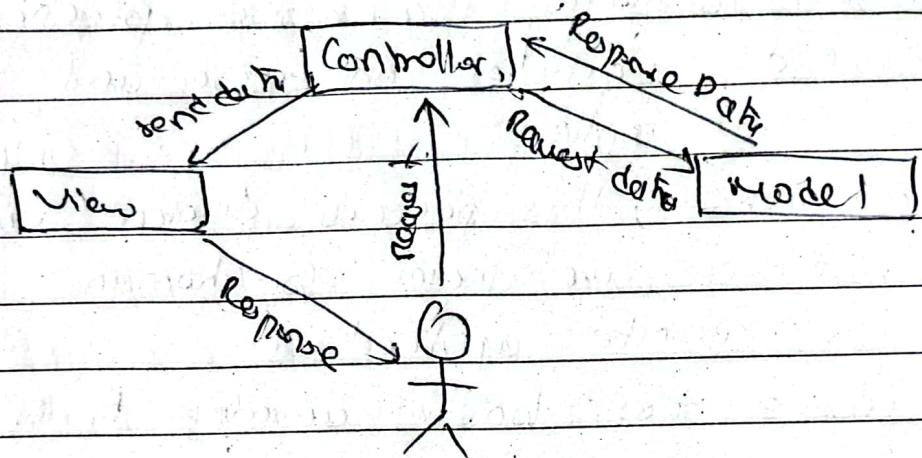
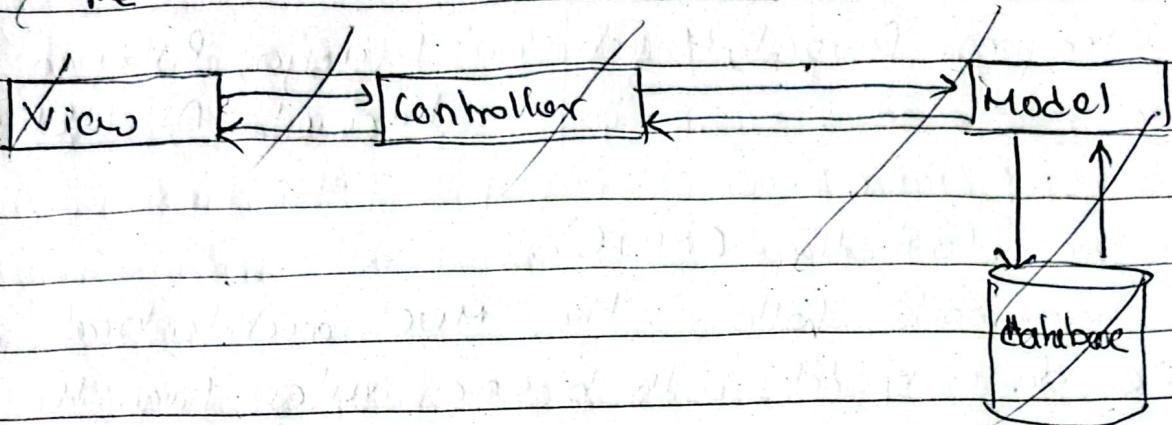
- It requires more time initially for setup and development

- It is less flexible for custom solutions
 - Eg: Wordpress, Drupal, Magento etc
 - It is more flexible for custom solutions
 - Eg: Django, Ruby on Rails, Laravel, ASP.NET MVC etc
- = Model View-Controller (MVC)
- Many frameworks follow the MVC architectural pattern to separate data model with business rules from the user interface.
 - This is generally considered a good practice as it modularizes code, promotes code reuse and allows multiple interfaces to be applied.
 - In web applications, this permits different views to be presented, such as web pages for humans and web service interface for remote applications.
 - Web frameworks must function according to the architectural roles of browser and web protocols such as HTTP.



- Input is directed ^{use} to the controller
- View doesn't have any knowledge of the controller
- View is aware of the Model it is expecting to ^{on to} provide

- The user interacts with the 'View' by performing actions
e.g. clicking a button
- The



- User requests the data he/she needs to the controller
- The controller will request the data with the model which interacts with the database
- The model will respond back the requested data to controller
- The controller will pass the data to the View
- The view will format the data in appropriate form
- This formatted data is then sent to the client.

Q. What is Content Management system? Explain web application framework

= Content Management System (Same as Ques 2)

Web Application Framework (WAF)

- Web Application Framework (WAF) or simply web framework (WF) is a ~~soft~~ software framework that is designed to support the development of web applications including web services, web resources and web APIs.
- Web framework provide a standard way to build and deploy web applications on WWW.
- Most web framework are based on model-view-architecture
- Advantages of web framework
 - It provides faster development & prototyping
 - These frameworks are responsive by default
 - Basically most of the developers are aware of core classes, so, it's easier to work on, with a team.
 - Javascript widgets & plugins like modal, carousels, ~~and~~ etc are available
- Disadvantages
 - If you want your website to be different you have to create your own UI and custom CSS.
 - If you don't customize it enough, then many sites will look the same
 - These frameworks have some dependency on ~~js~~ jQuery.

Chapter-9 : The semantic web

Q) What is Semantic Web? Explain the importance of semantic web with suitable example.

- Semantic web is an extension to World Wide Web (Web 3.0)
- The purpose of semantic web is to provide structure to the web and data in general
- It emphasizes on representing a web of data instead of web of documents.
- It allows computers to intelligently search, combine and process the web content based on the meaning that the content has
- Importance of semantic web are:

i) Enhanced Data

i) Improve Data Accessibility: It makes data more discoverable and accessible through standardized metadata and annotations.

Eg: Libraries: By tagging content with standardized metadata, libraries can make their catalog more easily searchable.

ii) Advanced Search (Capabilities): It supports more precise and context-aware search queries.

Eg: If you search for 'Jaguar', google can distinguish between the car brand and the animal by understanding the context provided by surrounding words.

iii) Automation of Data Processing: It enables automated reasoning and decision making by providing a machine-readable data format.

Eg: E-commerce recommendation: Online stores like Amazon uses semantic web to recommend products.

i) Supports for AI and machine learning: It provides rich data for training AI and machine learning models.

Eg: AI applications like Siri and Alexa uses semantic web data to better understand user queries.

j) Data exchange: It facilitates data exchange between different systems and applications by using common standards and formats.

Eg: Healthcare system: Different health care providers can share patient records using RDF and OWL.

2) write short notes on RDF

- RDF

- RDF stands for Resource Description Framework
- It is a framework for describing resources on the web.
- RDF is designed to be read and understood by computers
- It is not designed to be displayed to people
- It is written in XML
- The RDF language is a part of W3C's Semantic Web architecture
- W3C's "Semantic Web Vision" is a future where
 - web information has exact meaning
 - web information can be understood and processed by computers
 - computers can integrate information from web RDF
- RDF uses web identifiers (URLs) to identify resources
- RDF describes resources with properties and property values
- Explanation of Resource, Property and property values.
 - A Resource is anything that can have a URL, such as "<https://www.nce.edu.np>"
 - A Property is a resource that has a name, such as "author" or "homepage".

• A property value is the value of property such as "Ram Silwal".

3) What is Semantic web? Explain Semantic web (mention RDF and OWL).

= Semantic web (Same as Qno 1)

= RDF

- RDF stands for Resource Description Framework

- It is a framework for describing resources on the web

- RDF is designed to be read and understood by computers

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- RDF uses web identifiers (URIs) to identify resources

- RDF describes resources with properties and property values

- ~~Eg~~ • A resource is anything that can have a URL, such as "<https://www.hce.edu.np>".

• A property is a resource that has a name, such as "author" or "homepage".

• A property value is the value of property, such as ~~RAM SILWAL~~ "Ram Silwal".

= OWL

- The Web Ontology Language (OWL) is a family of knowledge representation languages for authoring ontologies

- Ontologies are a formal way to describe taxonomies and classification networks, essentially defining the structure of knowledge for various domains.

- Ontologies resembles class hierarchies in object-oriented programming but there is several critical differences

11. - Ontologies are typically far more flexible as they are meant to represent information on the internet and are expected to be evolving almost constantly, coming from all sorts of data sources whereas class hierarchies are meant to be fairly static.