1. **List the features, advantages and disadvantages of the various software stacks available for MySQL. (ex. XAMPP, LAMPP, WAMP, etc)**
2. **XAMPP**

**Features:**

* Free and open-source cross-platform web server solution stack which is supported by many Operating Systems such as MacOS, Linux and Windows
* The full form of XAMPP is X stands for Cross-platform, (A) Apache server, (M) MariaDB, (P) PHP, and (P) Perl. The Cross-platform usually means that it can run on any computer with any operating system.
* Supported by many file formats that add to its robustness
* Easy to install and use
* Control Panel makes it easy to manage and implement

**Merits:**

* It is free and easy to use and easily available for Windows, Linux and Mac OS
* It is very simple and lightweight to create set up for development, testing and deployment.
* It is a beginners friendly solution package for full stack web development.
* It handles many administrative tasks like checking the status and security.
* It is a open source software package which gives a easy installation experience.
* It is a time-saver and provides several ways for managing configuration changes.

**Demerits:**

* No password for database administrator
* MySQL can be accessed over a network
* ProFTPD is the default file transfer protocol (FTP) client used by XAMPP which uses a known password
* The Local Mail Server is not secure

1. **LAMPP**

**Features:**

* Open-Source web server solution stack for Linux OS
* Consists mainly of Apache HTTP Server, MySQL and interpreters for scripts written in PHP, Python and Perl programming languages.
* Scalable
* Can be acquired at a comparatively low price compared to other software architecture bundles.
* Light-weight

**Merits:**

* Open source
* Highly secure
* Helps in faster development
* Supports development by multiple programming languages such as PHP, Perl and Python

**Demerits:**

* Only compatible for Linux OS

1. **WAMP**

**Features:**

* Open-Source web server solution stack for Windows OS
* Consists mainly of Apache HTTP Server, MySQL and interpreters for scripts written in PHP, Python and Perl programming languages.
* Scalable

**Merits:**

* Open source
* Highly secure
* Easy to use
* WAMP makes easy to code PHP and creating databases in MYSQL on Windows Platform

**Demerits:**

* Only compatible for Windows OS
* Not easy to install as compared to XAMPP

1. **MAMP**

**Features:**

* Open-Source web server solution stack for Mac OS
* Consists mainly of Apache HTTP Server, MySQL and interpreters for scripts written in PHP, Python and Perl programming languages.
* Scalable
* Provides lot of tools necessary to run WordPress on local machine.

**Merits:**

* Open source
* Supports development by multiple programming languages such as PHP, Perl, Ruby and Python
* Provides various tools to the user like ability to set up Nginx server, mobile testing tools and built-in editors

**Demerits:**

* Only compatible for Mac OS

1. **List and explain the features of top five relational databases.**
2. **MySQL**

Following are some of the features of MySQL:

1. **Open-Source:** MySQL is free to use and easy to understand
2. **Secure:** It provides a secure interface since it has a password system which is flexible, and ensures that it is verified based on the host before accessing the database. The password is encrypted while connecting to the server.
3. **Scalable:** Scalability refers to the ability of systems to work easily with small amounts of data, large amounts of data, clusters of machines, and so on. MySQL server was developed to work with large databases.
4. **Datatypes:** MySQL supports multiple data types like unsigned integers, signed integers, float (FLOAT), double (DOUBLE), character (CHAR), variable character (VARCHAR), datetime, etc.
5. **Quick and reliable:** MySQL stores data efficiently in the memory ensuring that data is consistent and not redundant. Hence, data access and manipulation using MySQL is quick.
6. **PostgreSQL**

Following are some of the features of PostgreSQL:

1. **Secure:** PostgreSQL is safe as it provides a robust access control system, supports column and row-level security and includes several authentications such as Lightweight Directory Access Protocol (LDAP), Security Support Provider Interface (SSPI), etc.
2. **Highly reliable:** It is highly reliable and also provides disaster recovery such as active standbys, Point in time recovery (PITR), supports write-ahead logging (WAP), tablespaces ,etc.
3. **Compatible with multiple data-types:** It supports various data types like structured (Array, Date and Time), Primitives (String, Integer, Boolean, Numeric), Geometry (Polygon, Circle, Point, Line) and Document (XML, JSON/JSONB, Key-value)
4. **Compatible with Data Integrity:** It supports data integrity which includes Primary keys, Unique, NOT NULL, Foreign Keys, Explicit Locks, Advisory Lock and Exclusion Constraints
5. **Helps to improve the functionality of Server-Side Programming.**
6. **Microsoft SQL Server**

Following are some of the features of Microsoft SQL Server:

1. **Intelligence on all your data with Big Data clusters:** being able to query your entire data estate from SQL Serve to Oracle without replication.

**(b) Choice of Language and Platform:** From Windows or Linux, to Kubernetes deployments.

**(c) Intelligent database capabilities:** in-memory, persistent memory support, in-memory optimized tempdb

**(d) Data encryption and compliance:** Its data protection, monitoring and classification system has made it one of the top most secure platforms according to the National Institute of Standards and Technology database for 9 years.

**(e) Mobile BI and scalability:** Allowing you to easily integrate your database management systems with any device and Azure services for better performance and analytical capabilities on data.

1. **Oracle**

Following are some of the features of Oracle database:

1. **Scalability and performance:** Features like Real Application Clustering and Portability make a database scalable according to its usage. In a multiuser database, it is required to control data consistency and concurrency which Oracle contemplates.
2. **Availability:** Features like Real Application Clustering and Portability make a database scalable according to its usage. In a multiuser database, it is required to control data consistency and concurrency which Oracle contemplates.
3. **Backup and Recovery:** Its layout has complete recovery features to recover data from almost all kinds of failures. In case of failure, the database needs to be recovered within no time for high availability. Unaffected parts of data are available while the affected ones are getting recovered.
4. **Security:** Securing the data is always the top priority. It provides mechanisms to control data access and usage. Implementing authorization and editing user actions can prevent unauthorized access and allow distinct access to the users.
5. **IBM DB2**

Following are some of the features of IBM DB2 Database:

1. Advanced Protection

(b) Continuous availability

(c) Automated administration and tuning

(d) Multiple datatypes and languages

(e) Scaling

1. **Explain the following NOSQL types and explain one example in each type.**

**a) Document store**

**b) Key-value store**

**c) Graph databases**

**d) Time series databases**

1. **Document store**

* A document-oriented database or a NoSQL document store is a modern way to store data in JSON format rather than simple rows and columns.
* It allows you to express data in its natural form the way it's meant to be.
* With such problems faced by data intensive and fast-moving organizations, new technology solutions were demanded and the answer is NoSQL Document Databases.
* In contrast to rows and columns, NoSQL databases keep data in documents. These documents follow a minimum of standard format rules (so that the database can understand it for post processing). The format used could be JSON, XML, YAML etc.
* The JSON format is the format of choice for NoSQL databases, and for good reason. A JSON document is simply more compact and more readable.

**Example:** MongoDB

MongoDB is a scalable, flexible [NoSQL](https://www.mongodb.com/nosql-explained) document database platform designed to overcome the relational databases approach and the limitations of other NoSQL solutions. MongoDB is well known for its horizontal scaling and load balancing capabilities, which has given application developers an unprecedented level of flexibility and scalability.

1. **Key-value store**

* This specific type of NoSQL database uses the key-value method and represents a collection of numerous [key-value pairs](https://www.techtarget.com/searchenterprisedesktop/definition/key-value-pair).
* The keys are unique identifiers for the values.
* The values can be any type of object -- a number or a string, or even another key-value pair in which case the structure of the database grows more complex.
* Key names can range from as simple as numbering to specific descriptions of the value that is about to follow.
* A key-value database can be thought of as a dictionary or a directory. Dictionaries have words as keys and their meanings as values.

**Example:** Amazon DynamoDB

Amazon DynamoDB is a NoSQL managed database service provided by Amazon that stores semi-structured data like key-value pairs. A DynamoDB table consists of items. Each item consists of one partition key and one or more attributes. A partition key is used to differentiate between items. A query operation in DynamoDB finds items based on primary key values. The name of the partition key attribute and a single value for that attribute must be provided. The query returns all items searched against that partition key value.

1. **Graph databases**

* A graph database is a type of database used to represent the data in the form of a graph. It has three components: nodes, relationships, and properties.
* These components are used to model the data. The concept of a Graph Database is based on the theory of graphs. It was introduced in the year 2000.
* They are commonly referred to [NoSQL](https://www.geeksforgeeks.org/introduction-to-nosql/)databases as data is stored using nodes, relationships and properties instead of traditional databases.
* A graph database is very useful for heavily interconnected data. Here relationships between data are given priority and therefore the relationships can be easily visualized.
* They are flexible as new data can be added without hampering the old ones. They are useful in the fields of social networking, fraud detection, [AI Knowledge](https://www.geeksforgeeks.org/artificial-intelligence-an-introduction/) graphs etc.

**Example:** Neo4j

Neo4j is the world's leading open- source Graph Database which is developed using Java technology. It is highly scalable and schema free (NoSQL). Neo4j is a *native graph database*, which means that it implements a true graph model all the way down to the storage level. The data isn’t stored as a "graph abstraction" on top of another technology, it’s stored just as you whiteboard it. This is important because it’s the reason why Neo4j outperforms other graphs and stays so flexible.

1. **Time series databases**

* A time-series database (TSDB) is a computer system that is designed to store and retrieve data records that are part of a “time series,” which is a set of data points that are associated with timestamps. The timestamps provide a critical context for each of the data points in how they are related to others.
* Time series data is often a continuous flow of data like measurements from sensors and intraday stock prices.
* A time-series database lets you store large volumes of timestamped data in a format that allows fast insertion and fast retrieval to support complex analysis on that data.

**Example:** TimescaleDB

TimescaleDB is an open-source database designed to make SQL scalable for time-series data. It is engineered up from PostgreSQL and packaged as a PostgreSQL extension, providing automatic partitioning across time and space (partitioning key), as well as full SQL support.