

Part 1 - Define the following terms

- Data: known facts that can be recorded and have an implicit meaning.
- Database: a collection of related data.
- DBMS: a computerized system that enables users to create and maintain a database.
- Database Catalog: descriptive information about a database, stored in a DBMS.
- Program-data Independence: property by which the modification of a data file which is stored in the DBMS does not affect the access program, in this case the DBMS access program.
- User view: perspective of the database given to a user, that is view of part or all the contents in a database facilitated to a specific user.
- DBA: user who has special permission to administer, control, coordinate and monitor the database itself, the DBMS and related software.
- End user: people whose jobs require access to the database for querying, updating, and generating reports.
- Canned transaction: constant querying and updating of the database through standard types of queries and updates carefully programmed and tested.

Part 2 – Difference between:

Database Schema	Database State
<ul style="list-style-type: none">- It refers to the description of the database itself.- A database schema is specified during the database design.- A database schema changes infrequently.- That is how many tables the database has, how many attributes each table of the database has, the datatype of each attribute in each table.	<ul style="list-style-type: none">- It refers to the data in the database at a particular moment in time.- A database state changes frequently.- Say today the database has x number of records and tomorrow it has x+1 records then the state of the database has changed.

Part 3 – Describe the main Components of a DBMS

- Hardware: the computer used for keeping and accessing the database. These can also include secondary storage devices like hard drives.
- Software: the DBMS itself between the physical database and the users of the system.
- Data: the data stored in the database.
- Users: the different types of users such as DBAs or native users.

Part 4 – Describe the types of facilities you would expect to be provided in a multi-user DBMS.

- Buffer Management: schedules disk read/write operations.
- Stored Data Manager: controls access to DBMS information that is stored on disk be it for the database or the catalog.
- Interactive Query: interface by which users can obtain information from the database.
- Query Compiler: parses and validated the correctness of queries syntax, name of files and data elements.
- Query Optimizer: arranges and orders operations to eliminate redundancies and makes use of efficient search algorithms.
- Runtime Database Processor: executes privileged command, executable query plans and canned transactions with runtime parameters.
- Client Computer: runs DBMS client software which connects to the database

- Database Server: hosts the database.
- Backup: utility that create a backup copy of the database by storing the entire database into a mass storage medium.
- Performance Monitoring: utility that monitors database usage providing statistics to the DBA.

Part 5 – Explain the difference between logical data independence and physical data independence.

Logic Data Independence	Physical Data Independence
<ul style="list-style-type: none"> - Its mainly concerned with the structure of the data. - Changes in the logical level, do require changes at the application level. - For example, the addition or deletion of an attribute. 	<ul style="list-style-type: none"> - Its mainly concerned with how data is stored in the system. - Changes at this level, do not require changes at the application level. - For example, the addition or deletion of storage devices.

Part 6 – Explain the difference between external, internal, and conceptual schemas.

How are these different schema layers related to the concept of logical and physical data independence?

External Schema	Conceptual Schema	Internal Schema
<ul style="list-style-type: none"> - Also known as “View Schema” it describes the database part a particular user group is interested and hides the remaining database from that user group. 	<ul style="list-style-type: none"> - Conceptual schema is a high-level description of informational needs underlying the design of a database. In other words, a map of concepts and their relationships. 	<ul style="list-style-type: none"> - The Internal schema defines the physical storage structure of the database

- External and Conceptual schema relate to logical independence. While the Internal schema is associated with the physical schema.

Part 7 – What is the difference between:

Two-tier Architecture	Three-tier Architecture
<ul style="list-style-type: none"> - A two-tier architecture is divided into two parts the client and server. - Application wont scale as number of users increase - User has direct access to data making data vulnerable to attacks, errors and more. 	<ul style="list-style-type: none"> - A three-tier architecture is divided into three parts the client, the business (logic) and the server. - Higher scalability. - Improved security

Part 8 – Search the job listing sites and list detailed job requirements for:

Database Administrator

<https://www.indeed.com/jobs?q=database+administrator&l=New+York%2C+NY&from=searchOnHP&redirected=1&vjk=dc1528ea7d0533ba>

Responsibilities:

- Perform database installation, upgrade, migration, configuration, administration, and security patches.
- Design and implement database structures on relational schemas and tables. Perform other database housekeeping activities such as security administration, user access management, backup/recovery, and performance monitoring.
- Execute routine database backup and disasters recovery activities.
- Perform service packs and security patches updates at the OS and MS SQL Server levels, as well as other database-related vulnerabilities remediation to comply with the Branch policies and standards.
- Monitor, troubleshoot databases issues, and conduct performance tuning, including but not limited to slow queries, statistics, indexing, partition, etc.
- Deploy new code release in lower and production environments.
- Conduct database maintenance, performance tuning, capacity planning, database optimization, and other database administration tasks.
- Implement SQL Logins, Roles and Authentication Modes as a part of Security Policies for various categories of users.
- Diagnose and troubleshoot ETL process and database errors.
- Develop processes and build standards for Data Replication, Database Security, Encryption, Compression and Data Masking/Redaction.
- Manage and administer database access and database user access management, set and maintain database standards.
- Maintain version control on system servers and other application servers.
- Report on KRI & KPI metrics regarding usage and performance.

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- Create and manage database reports, visualizations, and dashboards.
 - Create automation for repeating database tasks.
 - Respond in a timely manner to user-reported errors.
 - Suggest changes and improvements for database maintenance or protection.
 - Design databases with both front-end and back-end users in mind.
 - Strong organizational skills with attention to detail and the ability to manage multiple and

Database Developer

<https://www.linkedin.com/jobs/search/?currentJobId=3282958525&keywords=database%20developer>

What you need to know (or technical skills/competencies)

- 5+ years of experience administering and managing OpenSource MySQL, MariaDB, AWS Aurora or Percona.
- Deep knowledge and experience designing and maintaining relational databases MySQL
- 5+ years building and maintaining complex mission-critical production database systems.
- Experience analyzing issues from the application tier to database.
- Experience working directly with cross-functional teams, resolving data or/and database related issues.
- Experience using at least one benchmarking tool for database performance testing, such as HammerDB, Sysbench or other tools
- Working knowledge of at least one scripting language (Shell, Python).
- Familiarity with Amazon Web Services (Aurora, RDS, DynamoDB, DMS, Lambda, EC2, EBS, S3, IAM etc.)
- Systems engineering experience, including Linux performance, memory management, I/O tuning, configuration, security, networking and troubleshooting
- Familiarity with configuration management systems (eg : Saltstack, Ansible)
- Knowledge and experience with Percona platforms, Xtrabackup and Percona Toolkit.

Database Designer

<https://www.linkedin.com/jobs/search/?currentJobId=3240812265&geoid=103644278&keywords=database%20designer&location=United%20States&refresh=true&start=25>

Principal Duties And Responsibilities

- Supporting the development and maintenance of online research management systems, including several complex REDCap projects. This includes designing, coding and testing data collection tools and interfacing and communicating with domain area investigators.
- Creating and documenting workflows and writing testing protocols.
- Creating logical data models using best practices to ensure high data quality and reduced redundancy.
- Collaborating with physician scientists and other clinical investigators to rapidly implement changes to the electronic data capture system.
- Performing reverse engineering of physical data models from databases and SQL scripts.
- Implementing data strategies, building data flows and developing conceptual data models.
- Supporting data harmonization efforts with other established projects.
- Developing best practices for standard naming conventions and coding practices to ensure consistency of data models.
- Developing documentation for existing and new projects.