Long Questions

1. What is the historical perspective of database system applications?
2. Compare and contrast file systems with a DBMS.
3. What is the significance of the data model in database systems?
4. Define the levels of abstraction in a DBMS.
5. Explain data independence in databases.
6. What is the typical structure of a DBMS?
7. How does database design relate to ER diagrams?
8. Define entities and attributes in a database.
9. What is an entity set, and how is it different from an entity?
10. Explain the concept of relationships in a database.
11. Define relationship sets and provide an example.
12. What are additional features of the ER model?
13. How is conceptual design achieved using the ER model?
14. Describe the process of designing a database.
15. What is the role of ER diagrams in the design process?
16. Define cardinality in the context of relationships.
17. Explain the difference between a weak and a strong entity.
18. How does normalization contribute to database design?
19. What is the purpose of a primary key in a database table?
20. Describe the importance of foreign keys in relational databases.
21. Explain the concept of a schema in a DBMS.
22. Define data redundancy and how it is minimized in databases.
23. What is the role of indexing in a database system?
24. Differentiate between horizontal and vertical partitioning in databases.
25. How does a DBMS ensure data integrity?
26. Create a table named ""Employees"" with the following columns:

    EmployeeID (integer, primary key)

FirstName (text)

LastName (text)

Email (text, unique)

HireDate (date)"

"Consider a database for a library with the following tables:

Books (BookID, Title, Author)

Customers (CustomerID, Name, Email)

Loans (LoanID, BookID, CustomerID, DueDate)

27. Write an SQL query to retrieve the names of customers who have borrowed books with the title ""Database Systems"" by ""John Doe."""
28. "Assume you have a table named ""Orders"" with the following columns: OrderID (int), CustomerName (text), OrderDate (date), and TotalAmount (decimal). Write an SQL query to retrieve the total amount spent by each customer in the year 2023. Include customer names and their total spending.
29. Assume you have a table named "Employees" with the following columns: EmployeeID (int), FirstName (text), LastName (text), and HireDate (date). Write an SQL query to retrieve the first and last names of employees who were hired in the year 2022.
30. Explain the key differences between storing data in a traditional file system and using a Database Management System (DBMS). Provide a brief code example illustrating the limitations of a file system when handling data retrieval and update operations compared to a DBMS.
31. Explain the importance of integrity constraints in the relational model?
32. How are integrity constraints enforced in a relational database?
33. How do you query relational data in the context of the relational model?
34. What is the process of logical database design in the relational model?
35. What is the role of views in a relational database?
36. What are the potential advantages of using views in a relational database?

37. How do you delete a table in a relational database, and what precautions should be taken?
38. How can you alter the structure of an existing table in SQL?
39. What is the distinction between the DROP and DELETE statements in SQL?
40. What role does relational algebra play in performing operations on relational databases?
41. Explain the concept of projection in relational algebra.
42. How is the selection operation used to filter data in relational algebra?
43. Describe the difference between union and intersection operations in relational algebra.
44. What is the purpose of the join operation in relational algebra?
45. What is the Cartesian product, and how does it differ from a natural join?
46. What is the closure property in the context of relational algebra?
47. How is the division operation used in relational algebra?
48. Explain the concepts of tuple and domain relational calculus.
49. How does the enforcement of referential integrity benefit a relational database?
50. What are some common types of integrity constraints in a relational database?
51. How can you specify filtering conditions in SQL queries, and why is it important?
52. What is the role of aggregation operators in SQL, and provide examples of such operators.
53. What is the purpose of NULL values in a relational database, and how are they handled in SQL queries?
54. What are complex integrity constraints in SQL, and why are they important for data quality?

55. What distinguishes an active database from a traditional database, and what are the advantages of using an active database system?
56. "Assume you have a table named ""Students"" with the following columns: StudentID (int, primary key), FirstName (text), LastName (text), and Age (int). Implement the following integrity constraints:

    Ensure that the ""Age"" column contains values between 18 and 60.

    Ensure that the combination of ""FirstName"" and ""LastName"" is unique.

    Write the SQL statements to enforce these constraints."
57. Given a table named "Orders" with columns: OrderID (int), CustomerName (text), OrderDate (date), and TotalAmount (decimal). Write an SQL query to retrieve the total sales amount for each month in the year 2023.
58. Create a view named "HighValueCustomers" that lists the names and email addresses of customers who have made total purchases (TotalAmount) exceeding $500 in the "Orders" table.
59. "Assume you have a table named ""Employees"" with columns: EmployeeID (int, primary key), FirstName (text), LastName (text), and Salary (decimal). Implement the following tasks:

    a)Write an SQL statement to completely delete (destroy) the ""Employees"" table.

    b)Write an SQL statement to add a new column named ""Department"" (text) to the ""Employees"" table."

60. Given a relation "Orders" with attributes: OrderID (int), CustomerName (text), OrderDate (date), and TotalAmount (decimal), write a domain relational calculus expression to retrieve the OrderIDs of orders placed by

customers whose names start with the letter 'A' and have a total amount greater than $100.

61. Explain the components of a SQL SELECT query.
62. Describe the purpose and usage of UNION, INTERSECT, and EXCEPT operators in SQL.
63. What are nested queries in SQL, and how can they be used to retrieve data? Provide an example.
64. Explain the concept of aggregation operators in SQL. Provide examples.
65. How does SQL handle NULL values, and what are the IS NULL and IS NOT NULL operators used for?
66. Discuss complex integrity constraints in SQL. Provide an example of a complex constraint.
67. Define triggers in SQL and explain their use with a real-world scenario. Provide an example.
68. Describe the advantages of using active databases and provide examples of situations where they are beneficial.
69. Explain the importance of data redundancy in database design and the problems it can lead to.
70. What is schema refinement in database design, and why is it necessary? Discuss the common problems that schema refinement aims to address.
71. Define decomposition in the context of schema refinement. How does decomposition help in improving database design?
72. What are functional dependencies in a relational database, and how are they determined? Provide an example.
73. Explain the concepts of First Normal Form (1NF), Second Normal Form (2NF), and Third Normal Form (3NF) in database normalization.
74. Define Boyce-Codd Normal Form (BCNF) and discuss its significance in database design.

75. What is lossless join decomposition, and why is it important when decomposing database tables?