Assignments

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RDBMS Concepts

Sr. No.	
1.	**Dynamic Data Solutions Ltd.** is a popular company based in **Chicago**, **Illinois** providing database solutions to its clients. The company is in the process of conducting recruitment interviews in different technical institutes for upcoming projects. The candidates interested in database development can attend the campus interviews. Based on their performance, the candidates are provided short-term training in any DBMS of their choice and recruited for database development in the company. Consider yourself as a student of second year Computer Science who has participated in the campus interview. You have been provided with a set of interview questions as follows: 1. Explain in brief the meaning of data and database. 2. List the two different approaches for data management. 3. Explain the benefits of a DBMS. 4. List the different database models used in the industry. 5. Explain the RDBMS model in brief and differentiate between DBMS and RDBMS.

Entity-Relationship (E-R) Model and Normalization

Sr. No.	Assignment Question
1.	**St. Mary Technical Institute** is a famous institute located in **New Jersey**, **USA**. The institute provides training in subjects of Computer Science such as database, programming languages, networking, and so on. The institute also organizes technical competitions to test the aptitude of its students. The winner is provided a certain amount as scholarship to learn additional courses in the institute. You, as a student, have participated in the database development competition. You have been provided with a table 2.1 as follows:

Student ID	Student Name	Course ID	Course Title	Fees	Marks
S001	Rob Martin	C001	Programming in Java	5000	50
S002	Maria Stevens	C001	Programming in Java	5000	70
S003	Clark Hood	C002	Networking Fundamentals	6000	80
S002	Maria Stevens	C002	Networking Fundamentals	6000	75
S003	Clark Hood	C003	Database Management	7000	68
S001	Rob Martin	C003	Database Management	7000	79
S002	Maria Stevens	C003	Database Management	7000	90

Table 2.1: StudentDetails Table

1. Identify the problem in the given table.
2. Provide a solution to resolve the problem.

(**Hint**: Use the concept of Normalization.)

Introduction to SQL Server 2012

Sr. No.	Assignment Question
1.	**Wixia Technologies** is an IT-based organization that provides various IT-related services ranging from Web designing to Web application development. Business intelligence services are a requirement that most clients of **Wixia Technologies** are asking for. Hence, the organization plans to revamp its database to a new model that can support business intelligence services. Also, the company plans to release a social networking Web site that would have big data. This also needs to be taken into consideration. Looking at this scenario, as an external consultant for **Wixia Technologies**, would you recommend SQL Server 2012? Which edition of SQL Server 2012 would you recommend for **Wixia Technologies**?

SQL Azure

Sr. No.	Assignment Question
1.	**Vertigo Systems** is a technology-based organization that creates computer applications. The organization uses SQL Server 2012 for database storage. Database administrators are assigned by the company to configure and manage the data. The organization plans to develop Web applications that would be connected to a back-end database. These applications would be used in different locations across the globe. For this, one of the suggestions received is to use SQL Azure as the back-end database instead of on-premises SQL Server 2012. As a database administrator, you need to support the usage of SQL Azure by providing strong reasons to support why SQL Azure would be a better option in this scenario.

Transact-SQL

Sr. No.	Assignment Question

1. **World Class Travel and Tours** operator wants to store information of all the important flights in the world. The operator wants to provide flight information at the earliest to the customers. Create a **Flights** table 5.1 that will store all the flight details.

Field Name	Type	Size	Description
AircraftCode	nvarchar	10	Identifies each aircraft
FType	nvarchar	10	Stores the type of aircraft
Source	nvarchar	20	Stores the source of the flight
Destination	nvarchar	20	Stores the destination of the flight
DepTime	DateTime		Stores the departure time of the flight
JourneyHrs	int		Stores the total journey hours

Table 5.1: Structure of Flights Table

The **Flights** table contains the following information.

AircraftCode	FType	Source	Destination	DepTime	Hours
UA01	Boeing	Los Angeles	London	15.30	6
UA02	Boeing	California	New York	09.30	8
SA01	Boeing	Istanbul	Ankara	10.45	8
SA02	Airbus	London	Moscow	11.15	9
SQ01	Airbus	Sydney	Ankara	01.45	15
SQ02	Boeing	Perth	Aden	13.30	10
SQ03	Airbus	San Francisco	Nairobi	15.45	15

Table 5.1: Data of Flights Table

Use the appropriate command to perform the following tasks:

1. Display all the records from the **Flights** table.
2. Display AircraftCode, Source, Destination, and DepTime from the Flights table.
3. Consider that journey hours of each flight is increased by four hours due to technical problem. Display the records of Flights table with the increased journey hour. (Hint: Use an expression to increase journey hours by four).
4. Add appropriate comments to all the query statements written so far.

Creating and Managing Databases

Sr. No.	
1.	**Book On Air Pvt. Ltd.** is an airline ticket-booking firm in **Chicago**, **Illinois**. The company books tickets for its customers for various airlines. However, to maintain the records of the number of tickets booked, customer details, flight details, payment details, and so on, the company uses the traditional file system. With growing business needs, it has become difficult to maintain such huge data. Therefore, the management has decided to develop a database to store the company transactions related data. You as a database developer have been assigned the task to provide a solution. 1. Explain in brief the features of SQL Server 2012 to justify its use as an RDBMS to solve the problem. 2. Create a database with adequate size for storing data. 3. Modify the database to increase the file growth. 4. Set the ownership of the database to current user. 5. Set the `AUTO_SHRINK` option **ON** for the database.

Creating Tables

Sr. No.	Assignment Question
1.	**St. Paul's Training Institute** is a training institute located in **Los Angeles**, **USA**. The institute provides training in various courses in different fields such as science, mathematics, and so on. Recently, the institute started using a primitive database system in which it stores the student and staff details. In the current database, there is only one table to store the student details and another to store the staff details. However, the users are finding it very difficult to trace student and staff records since, all the details are in the same table. (**Assumption**: Database is already created.) You as a database developer have to accomplish the following tasks: 1. Create separate tables to store student details, marks details, employee details, salary details, and course details. 2. Create required columns in each table to store the relevant details. 3. Use appropriate data types for the columns to store the different type of data such as name, phone, email, salary, fees, and so on as per requirement. 4. Apply appropriate check constraints on the type of data to be stored in the respective columns. 5. Set the primary and foreign key constraints on appropriate columns to relate the relevant tables. 6. Insert new records in each table and verify that all the check constraints are working properly. 7. Update and delete records in the table to ensure primary and foreign key constraints are working properly. 8. Identify columns that may hold null value and apply constraints accordingly.

Accessing Data

Sr. No.	Assignment Question
1.	**MusicWorld Gallery** is a popular music gallery located in **New Jersey**, **USA** that sells music and video CDs. The management has recently automated all the transactions such as sales, data entry, purchases, and so on. The company has developed a database to generate all required reports. The database consists of tables such as Item Details, Audio CD Details, Video CD Details, Order Details, and Lease Details. However, the database allows adding and updating records, but data retrieval functionality is not working properly. The management wants to have reports of the items, monthly sales, and other details from the database. (**Assumption**: Database, tables, and columns have been created with relevant data.) You as a database developer, have to accomplish the following tasks: 1. Apply appropriate check constraints on the type of data to be stored in the respective columns. 2. Set the primary and foreign key constraints on appropriate columns to relate the relevant tables. 3. Create an XML type column in the Item Details table to store the description details. 4. Create a query to retrieve the details of all CDs for a particular artist. 5. Create a query to retrieve the details of all orders for a particular date. 6. Create a query to retrieve the details of all CDs for top two price rates. 7. Create a query to retrieve the maximum order amount for all CDs and remove duplicates. 8. Create a query to retrieve the description details from the XML column for a particular item.

Advanced Queries and Joins

Sr. No.	Assignment Question

1. **Cosmos Electronics Ltd.** employs more than 1,000 workers in its units. Some of these are at junior level while some are at senior level depending upon their expertise and years of experience. Each employee is given annual leave based on the designation. The management at **Cosmos Electronics Ltd.** is planning to computerize their human resources department and all the data pertaining to employees will now be stored in SQL Server 2012 databases. The structure for **EmpDetails** and **LeaveDetails** are shown in tables 9.1 and 9.2 respectively.

   - **EmpDetails Table**

Field Name	Data Type	Key Field	Description
Emp_Id	varchar(5)	Primary Key	Stores employee identification number
FirstName	varchar(30)		Stores first name of the employee
LastName	varchar(30)		Stores last name of the employee
Address	varchar(60)		Stores address of the employee
PhoneNumber	varchar(20)		Stores phone number of the employee, it could be landline or mobile
Dept_Id	varchar(4)		Stores department id of the department to which the employee belongs
Designation	varchar(30)		Stores designation or job role of the employee
Salary	money		Stores salary of the employee
Join_date	datetime		Stores date of joining for the employee
Performance_Rating	int		Stores Rating of the employee

Table 9.1: EmpDetails Table

- **LeaveDetails Table**

Field Name	Data Type	Key Field	Description
Emp_Id	varchar(5)	Primary Key	Stores employee identification number
LeaveTaken	int		Stores the number of leaves taken by the employee
FromDate	datetime		Date from when leave was availed
ToDate	datetime		Date upto which leave was taken
Reason	xml		Reason for the leave

Table 9.2: LeaveDetails Table

1. Using SQL Server 2012 and Transact SQL statements create the tables in a database named **Cosmos**. Add at least five records to each table.

2. Create a query to retrieve the number of leaves taken by employees having designation as Manager.

3. Create a query to retrieve details of all employees who have taken leave for more than five days.

4. Compare the records of employees with each other to see who have taken more number of leaves (**Hint**: use a self-join on the **LeaveDetails** table).

Using Views, Stored Procedures, and Querying Metadata

Sr. No.	Assignment Question

1. **BookParadise** is an online library management system used by a library in **Seattle**. The software makes use of SQL Server 2012 databases. Information about thousands of books are maintained and updated regularly. In the recent years, **BookParadise** has grown in size after receiving international funding and the number of books has increased tremendously. This increase in the number of books has made searching for books very difficult. Also, **BookParadise** needs to now allow searches to be made by users displaying only selective information to them. The entire content of the tables are not to be displayed to the users. Towards this end, views will be created to enable the readers to display information about books, in a fast and efficient manner.

   The **Books** table in the **BookParadise** database has the structure shown in table 10.1.

   - **Books**:

Field Name	Data Type	Key Field	Description
BookCode	varchar(5)	Primary Key	Book Identification Code
Title	varchar(30)		Title of the book
Author	varchar(30)		Author of the book
Edition	int		Edition number
RatePurchased	money		Cost price of the book
PurchaseDate	datetime		Date when book was purchased
VendorName	varchar(30)		Vendor who sold the book
BookStatus	varchar(15)		Indicates whether book is available or not

Table 10.1: Books Table

All the above fields, except the primary key, may accept null values.

1. Using SQL Server 2012 and Transact SQL statements, create the above table in a database named **BookParadise**. Add at least seven records to the table.

2. Next, create a view named **BookInfo** on the table, which will contain columns BookCode, Title, Author, Edition, and BookStatus. This view will need to check for domain integrity.

3. Test the view by displaying information from it. Display all the records in the view. Also, display the top 3 records in the view alphabetically sorted by the column Author.

4. Add three more records to the view.

5. Assuming that there is an author named Mary Clark whose books are listed in

the **BooksInfo** view, write the statements to replace all occurrences of Mary Clark in the column Author with Mary Higgins Clark.

2. **ToyzUnlimited** is a trendy toy store based in California. It buys toys from manufacturers, stocks them in its store, and sells them for profits. **ToyzUnlimited** maintains the details of all branded toy products in a SQL Server 2012 database. To speed up the day-to-day tasks and operations related to the database, it has been decided to use SQL Server 2012 stored procedures for commonly performed tasks. The structure for **Toys** table is shown in table 10.2.

   - **Toys**:

Field Name	Data Type	Key Field	Description
ProductCode	varchar(5)	Primary Key	Product Code that uniquely identifies each toy
Name	varchar(30)		Name of the toy
Category	varchar(30)		Category of the toy. Example: Block building, Board games, Puzzles, and so on.
Manufacturer	varchar(40)		Manufacturer name
AgeRange	varchar(15)		Age range for the kids to use the toy. Example: 3-5 years
UnitPrice	money		Price of the toy in dollars
Netweight	int		Weight of the toy in grams
QtyOnHand	int		Quantity available

Table 10.2: Toys Table

1. Start with creating the table **Toys**. The structure of the table is described above. Add at least five records to the table. Ensure that the value of the column QtyOnHand is more than 20 for each of the toys.

2. Write statements to create a stored procedure named **HeavyToys** that will list names of all the toys that are above 500 grams.

3. Write statements to create a stored procedure named **PriceIncrease** that will increment the unitprice of all toys by 10 dollars.

4. Write statements to create a stored procedure **QtyOnHand** that will decrease the quantity on hand of all toys by five.

5. Execute the stored procedures **HeavyToys**, **PriceIncrease**, and **QtyOnHand**.

6. Change the procedures **PriceIncrease** and **QtyOnHand** such that they will also display the newly updated values of price and quantity after the updation of these columns have taken place through the stored procedures mentioned earlier.

7. Remove all the stored procedures that were created so far.

Indexes

Sr. No.	Assignment Question
1.	**Smart Solutions Pvt. Ltd.** is a popular CA consultancy firm located in **Illinois**, **Chicago** that provides tax solutions to its clients. The management has recently automated all the transactions such as adding and updating client information, staff details, and so on. The company has developed a database to store data and to generate reports. However, the software is not working as expected and takes a long time to complete transactions. The management has decided to optimize the software for better performance. The CEO of the company has chosen your company to provide a solution for the same. After analysis of the software, the team has managed to rule out the cause of imperfect functioning. You, as part of the team, have been assigned the following tasks to improve the performance of the database. (**Assumption**: The database and tables have been created with appropriate data.) 1. Explain the purpose of applying indexes. 2. Apply appropriate index on the tables. 3. Create cursors to retrieve data from the tables.

Triggers

Sr. No.	Assignment Question
1.	**MobileZone** is a trendy mobile store based in **Alberta**, **Canada**. It purchases mobiles from manufacturers, stocks them in its store, and sells them for profits. **MobileZone** maintains the details of all branded mobile devices in a SQL Server 2012 database. To speed up the day-to-day transactions related to the database, it has been decided to use SQL Server 2012 triggers for commonly performed tasks. Table 12.1 describes the Mobile details.

- **Mobiles**:

Field Name	Data Type	Key Field	Description
ProductCode	varchar(5)	Primary Key	Product Code that uniquely identifies each mobile
BrandName	varchar(30)		Name of the mobile
Manufacturer	varchar(40)		Manufacturer name
UnitPrice	money		Price of the mobile in dollars
QtyOnHand	int		Quantity available

Table 12.1: Mobiles Table

1. Start with creating the table **Mobiles**. The structure of the table is described in Table 12.1. Add at least five records to the table. Ensure that the value of the column **QtyOnHand** is more than 20 for each of the mobiles.

2. Write statements to create an update the trigger named **MobilePrice** that will increment the **UnitPrice** by 10 dollars for all the mobiles.

3. Write statements to create an insert trigger named **NewMobile** that will insert the latest models of mobiles introduced by the company for the current year.

4. Check the working of the update and insert trigger.

Programming Transact-SQL

Sr. No.	Assignment Question
1.	**Limbos Ltd.** employs more than 2,000 workers in its units. Some of these are at senior level while some are at junior level depending upon their expertise and years of experience. Each employee is given annual leave based on the designation. The management at **Limbos Ltd.** is planning to computerize their human resources department and all the data pertaining to employees will now be stored in SQL Server 2012 databases. Table 13.1 lists the **EmployeeDetails** table.

- **EmployeeDetails Table**

Field Name	Data Type	Key Field	Description
Employee_Id	varchar(5)	Primary Key	Stores employee identification number
EmployeeName	varchar(30)		Stores name of the employee
Address	varchar(60)		Stores address of the employee
PhoneNumber	varchar(20)		Stores phone number of the employee, it could be landline or mobile
Department_Id	varchar(4)		Stores department id of the department to which the employee belongs
Designation	varchar(30)		Stores designation or job role of the employee
Salary	money		Stores salary of the employee
Join_Date	datetime		Stores date of joining for the employee
Performance_Rating	int		Stores Rating of the employee

Table 13.1: EmployeeDetails Table

Table 13.2 lists the **EmployeeLeave** table.

- **EmployeeLeave Table**

Field Name	Data Type	Key Field	Description
Leave_Id	varchar(5)	Primary Key	Stores leave identification number
Employee_Id	varchar(5)	Foreign Key	Stores employee identification number
LeaveTaken	int		Stores the number of leaves taken by the employee
FromDate	datetime		Date from when leave was availed
ToDate	datetime		Date upto which leave was taken
Reason	xml		Reason for the leave

Table 13.2: EmployeeLeave Table

1. Using SQL Server 2012 and Transact SQL statements create the above tables in a database named **EmployeeInfo**. Add at least 10 records to the tables.

2. Using the same **EmployeeDetails** table, create a Transact-SQL batch to return **EmployeeID**, **FirstName**, and **Department** of all such employees.

3. Write a batch to determine the total salary paid to a department based on the annual leave given to the employees.

4. The management wants to find out which department has the least number of leaves taken by the employees in the last five years.

   Hint: Use the `DATETIMEOFFSETFROMPARTS` function.

Transactions

Sr. No.	Assignment Question

1. **Sandoz Insurance (SI) Services** is a leading insurance company based in **California**. SI Services wanted a faster, more accurate, and less expensive way to handle insurance claims adjusting for its insurance company customers. With an ever-increasing customer support, they decided to create a Web based application that will be used not only by employees who work on field, but will also be used by the database administrators in the head office.

   Officers can use the software on the device type such as Tablet PCs or laptops in the field, or desktop PCs back in their offices. The use of Microsoft SQL Server 2012 as the software's database enables to receive and update all the necessary information regarding a customer.

   With thousands of customers expected every month, data integrity of the data in the database is very important. There are some new policies introduced by the SI Services for the benefit of the customers.

   1. Create a database called **Sandoz Insurance** services to store the details of the company. Create a table **CustomerHeader** with the following details.

      - **CustomerHeader** Table

Field Name	Data Type	Key Field	Description
ClientID	Int	Primary Key	Stores client id
FirstName	Char		Stores first name of the client
LastName	Char		Stores last name of the client
MiddleName	Char		Stores middle name of the client
Gender	Char		Stores gender of the client
DateOfBirth	DateTime		Stores date of birth of the client
Address	Varchar(max)		Stores address of the client
MaritalStatus	Char		Stores marital status of the client
Age	Int		Stores age of the client
Employment	Char		Stores occupation of the client
CompanyName	Varchar(max)		Stores the company name
CompanyAddress	Varchar(max)		Stores the company address

Table 14.1: CustomerHeader Table

- **CustomerDetails** Table

Field Name	Data Type	Key Field	Description
CustomerID	Int	Primary Key	Stores customer id
FatherName	Char		Stores the name of the customers father
MotherName	Char		Stores the name of the customers mother
Amount	Money		Stores the principal amount
Period	Int		Stores period for insurance
Plan	Char		Stores plan for insurance
Premium	Money		Stores premium
NomineeName	Char		Stores nominee name
Date	DateTime		Stores the date on which insurance is made

Table 14.2: CustomerDetails Table

2. Create a table **CustomerHeader** with the specifications given in table 14.1.
3. Create a transaction to update the new leave policies introduced by the company.
4. Only customers over the age of 21 are eligible to open an insurance policy at SI. Write a transaction, so that customers under the age of 21 are not allowed to make an entry to the database.
5. Check if the transactions are updated in the appropriate table.
6. Check if the transactions are not updated. Then, ensure that they are rolled back with the appropriate error messages.

Error Handling

Sr. No.	Assignment Question
1.	**Glen Technologies Private Limited** is a leading software company located at Amsterdam. The company has achieved many awards as the best dealer in the development of software technologies. The company has launched new mobile company **Glen Mobiles**. At present, **Glen Technologies** is working on a database project for Employee Management System in SQL Server 2012. While creating the tables, they have been receiving different types of errors. Assume that you are the database administrator of **Glen Technologies** and the technical head has assigned you the task of rectifying the errors. (**Assumption**: The database and tables are already created.) Perform the following steps: a. Write error-handling statements using the TRY…CATCH construct for both normal statements as well as stored procedures. b. Display the error information using the following: o ERROR_NUMBER o ERROR_MESSAGE o ERROR_LINE