**Assignment of Power-bi:**

* What is Power BI and how does it differ from Excel?
  + Power BI is a business intelligence tool made by Microsoft that helps to connect different data sources, prepare reports, and make dashboards. It is mainly used to analyze large amounts of data and present it in a visual and interactive way.
  + The difference between Power BI and Excel is that Excel is good for calculations, formulas, and small-scale data analysis, while Power BI is better for handling big data, creating automatic reports, and giving interactive visuals. Excel is more like a spreadsheet tool, but Power BI is a complete reporting and data analysis tool.
* Explain the concept of data modeling in Power BI.
* Data modeling in Power BI means arranging and connecting data tables so that analysis and reporting become accurate. It mainly uses two types of tables:
* Fact Table - stores measurable data like sales, salary, profit.
* Dimension Table - stores descriptive details like product info, employee details, and department.
* Example: In a sales report, the Sales table is a fact table, and the Product table is a dimension table. By linking them, we can easily see sales by product.
* What are the different types of connections available in Power BI?
* In Power BI, there are four types of connections:
* **Import Mode** - Data is stored inside Power BI. Reports are very fast, but we need to refresh to get new data.
* **Direct Query Mode** - Data is not stored. It queries the source directly, so data is always updated, but performance may be slower.
* **Lives Connection** - Connects directly to sources like SQL Server Analysis Services. All calculations happen at the source.
* **Composite Model** - A mix of Import and Direct Query in the same report. This gives flexibility to use both stored and live data together.
* Import is best for small/medium data, Direct Query for real-time needs, Live for enterprise systems, and Composite when we need a combination of both.
* How do you handle data transformation in Power BI?
* In Power BI, data transformation is done using **Power Query Editor**. It is used to clean and shape data before making reports. Common steps include removing duplicates, handling null values, changing data types, merging tables, splitting columns, and filtering rows.
* This process is called **ETL (Extract, Transform, Load)** and makes sure the data is correct and ready for analysis.
* **Example:** If we have an Employee table with missing salaries or extra spaces in names, we can use Power Query to fill missing values, trim spaces, and format the data properly before loading it into Power BI.

5) What is DAX (Data Analysis Expressions) and why is it important in Power BI?

* DAX (Data Analysis Expressions) is a formula and expression language used in Power BI, Excel, and Analysis Services. It is used to create **calculated columns, measures, and custom calculations** on data.
* It is important because it helps in building powerful calculations like totals, averages, year-to-date, percentage growth, and many advanced KPIs. Without DAX, Power BI reports would only show simple data, but with DAX we can perform deep analysis and create meaningful insights.
* **Example:** Using DAX, we can calculate “Total Sales = SUM (Sales [Amount])” or “Profit Margin = (Sales – Cost)/Sales.”

1. Can you explain the difference between calculated columns and measures in Power-bi?

* In Power BI, both calculated columns and measures are created using DAX, but they are different:
* **Calculated Column** → it is added to each row of a table and stored in the data model. Example: creating a “Full Name” column by joining First Name and Last Name.
* **Measure** → it is a calculation done on the fly and not stored. It is mainly used for aggregations like sum, average, or percentage. Example: “Total Sales = SUM (Sales [Amount]).”
* In short, calculated columns are row-based and stored, while measures are calculation-based and dynamic.

1. How do you handle relationships between tables in Power BI?

* In Power BI, relationships between tables are handled in the **Model view**. We connect tables using a common column. This allows data from different tables to work together in reports.
* When creating relationships, we set two things:
* **Cardinality** – it defines how rows from one table match with rows from another:
  + **1:1 (One-to-One):** One row in Table A matches one row in Table B. Example: one employee has one ID card.
  + **1: (One-to-Many):*\**** One row in Table A matches many rows in Table B. Example: one department has many employees.
  + **: (Many-to-Many):** Many rows in both tables can match. Example: students and courses.
* **Cross Filter Direction** – it defines how filters move between tables:
  + **Single:** Filter flows only in one direction (e.g., from Department to Employees).
  + **Both:** Filter flows both ways (e.g., filtering Employees also filters Department).
* **Example:** Linking an Employee table (with DeptID) to a Department table (with DeptID) using a one-to-many relationship helps us analyze employees by department.

1. What is the purpose of a Power BI Gateway?

* A Power BI Gateway is used to connect on-premises data (data stored in local servers or computers) with Power BI cloud services. It works like a bridge that securely transfers data from local databases (like SQL Server, Oracle, Excel files) to Power BI service for reports and dashboards.
* There are two types of gateways:
* **Personal Gateway** → for individual use refreshes data only for personal reports.
* **Enterprise Gateway** → for organizations allows multiple users to connect and schedule data refresh.
* **Example:** If sales data is stored in a company’s local SQL Server, a Gateway lets Power BI fetch and update that data in online dashboards.

1. How can you schedule data refresh in Power BI Service?

* In Power BI Service, we can schedule data refresh so that reports and dashboards always show updated data. After publishing a report to Power BI Service, we go to the **dataset settings** and set up a refresh schedule. We can choose how often (daily or multiple times a day) and at what time the refresh should happen.
* If the data source is on-premises (like local SQL Server or Excel), then a **Power BI Gateway** is required for refresh.
* **Example:** A sales dashboard can be set to refresh every morning at 8 AM, so the team always sees the latest sales numbers.

1. Explain the concept of row-level security in Power BI.

* Row-Level Security (RLS) in Power BI is used to restrict data access for specific users. It means users can only see the rows of data that are relevant to them, based on filters set by the report creator.
* RLS is applied by creating **roles and DAX filters**. For example, if a company wants each regional manager to see only their region’s sales, we can set up an RLS rule that filters data by region.
* This improves security and ensures users only see data they are allowed to see.

1. What is the Power BI Desktop and how does it differ from Power-

BI Service?

* **Power BI Desktop** is a free Windows application used to connect data, transform it, create reports, and design dashboards. It is mainly used for developing and building reports.
* **Power BI Service** is an online (cloud) platform where we publish, share, and view reports and dashboards. It allows collaboration, scheduled refresh, and sharing with others.
* In short, **Power BI Desktop = build reports**, and **Power BI Service = publish and share reports**.

1. Explain the concept of Direct Query in Power BI.

* Direct Query in Power BI is a connection mode where the data is **not stored** inside Power BI. Instead, every time we use a report, Power BI directly queries the data source (like SQL Server, Oracle, etc.).
* This means the report always shows the **latest data**, but performance can be slower if the source is large or complex. Also, some features like quick calculations are limited compared to Import mode.
* **Example:** If sales data is stored in SQL Server, using Direct Query will show real-time sales without importing the data into Power BI.

1. What are Power BI templates and how are they useful?

* Power BI Templates are files with the extension **.pbit** that contain the structure of a report (data model, queries, visuals, and formatting) but without the actual data.
* They are useful because they let us **reuse the same report design** with different datasets, saving time and keeping reports consistent. Templates also help in sharing report layouts across teams.
* **Example:** A company can create a sales dashboard template, and different regions can use it by just connecting to their own sales data.

1. How do you handle incremental data refresh in Power BI?

* Incremental data refresh in Power BI is used when we have very large datasets. Instead of refreshing the whole data every time, it only refreshes the **new or changed data**. This makes the refresh much faster and saves resources.
* We set up incremental refresh in **Power BI Desktop** by defining rules (for example, keep last 5 years of data and refresh only the last 1 month). After publishing to **Power BI Service**, it automatically applies these rules.
* **Example:** In a sales report with 10 years of data, we can set incremental refresh so that only the latest month’s sales are updated, while old data remains as it is.

1. What is the role of Power Query in Power BI?

* Power Query in Power BI is a tool used to **connect, clean, and transform data** before loading it into the data model. It helps remove errors, change data types, merge or split columns, filter rows, and prepare data for reporting.
* It works on the **ETL process (Extract, Transform, Load)**, making sure the data is accurate and ready for analysis.
* **Example:** If we get an Employee dataset with missing values and extra spaces, Power Query can be used to fix and clean it before creating reports.

1. Explain the difference between calculated columns and calculated tables in Power BI.

* In Power BI, both calculated columns and calculated tables are created using DAX, but they are different:
* **Calculated Column** → A new column added to an existing table, created row by row.  
  **Example:** Full Name = Employees[FirstName] & " " & Employees[LastName]
* **Calculated Table** → A new table created from existing tables or expressions, not from a single row.  
  **Example:** Sales\_2023 = FILTER(Sales, Sales[Year] = 2023)
* In short, calculated columns add extra fields inside a table, while calculated tables create a whole new table.

1. How do you create custom visuals in Power BI?

* In Power BI, custom visuals are used when the default visuals are not enough. We can create or add them in two ways:
* **Import from AppSource** → Power BI has a marketplace (AppSource) where many custom visuals are available, like Heatmaps, Gantt charts, etc.
* **Build your own** → Developers can create custom visuals using tools like **Power BI Developer Tools (using TypeScript and Node.js)** and then import them into Power BI.
* **Example:** If we need a Gantt chart for project tracking, we can download it from AppSource and use it in the report.

1. What are the best practices for optimizing performance in

Power BI?

* **Use Star Schema** – keep the data model simple with fact and dimension tables.
* **Remove Unnecessary Columns/Rows** – only load the data needed for reporting.
* **Use Measures instead of Calculated Columns** – measures are faster and lighter.
* **Reduce Data Volume** – apply filters or aggregations to avoid loading very large datasets.
* **Enable Incremental Refresh** – refresh only new/changed data instead of all data.
* **Optimize DAX Queries** – write efficient formulas for better speed.
* **Example:** Instead of loading 10 years of sales data, keep only the last 3 years for faster performance.

1. How can you integrate Power BI with other Microsoft products like Azure and Office 365?

* Power BI can be easily integrated with other Microsoft products to make reporting more powerful:
* **With Azure** → Power BI connects to Azure SQL Database, Azure Data Lake, and Azure Synapse to get big data and advanced analytics. Azure Machine Learning models can also be used inside Power BI for predictions.
* **With Office 365** → Power BI integrates with Excel (importing pivot tables, charts, and data models) and with Teams/SharePoint for sharing dashboards and collaboration.
* **With Power Platform** → Works with Power Apps and Power Automate to build complete business solutions.
* **Example:** A company can store data in Azure SQL Database, analyze it in Power BI, and then share reports directly in Microsoft Teams.

1. Explain the concept of aggregations in Power BI.

* Aggregations in Power BI are a way to make reports faster when working with large datasets. Instead of always using detailed data, Power BI creates a **summary table** with pre-calculated values like sum, average, count, or max.
* When a user runs a report, Power BI first checks the aggregation table. If the answer is available there, it uses it (fast). If not, it goes to the detailed data.
* **Example:** Instead of loading millions of sales transactions, we can create an aggregation table that stores Total Sales by Year and Region for faster analysis.

1. How do you handle error handling and data quality in Power BI?

* In Power BI, error handling and data quality are managed mostly in **Power Query Editor** before loading data. We can:
* Remove or replace **null values**.
* Detect and fix **data type errors** (e.g., text in a number column).
* Remove **duplicates** and unnecessary rows.
* Use transformations like trimming spaces, splitting/merging columns, and validation checks.
* Apply conditional rules to handle missing or incorrect data.
* This ensures the dataset is clean, accurate, and ready for reporting.
* **Example:** If an *Employee* table has blank salary values, we can replace them with 0 or an average value using Power Query.

1. What is the purpose of Power BI Embedded and when would you use it?

* Power BI Embedded is a service in **Microsoft Azure** that allows developers to embed Power BI reports and dashboards into their own applications or websites. Users can see and interact with the reports without opening Power BI separately.
* It is mainly used when companies want to provide analytics inside their apps for customers or employees.
* **Example:** A software company can embed Power BI dashboards inside its HR or Sales application so users can see reports directly in the app.