**Module-5**

**Creating Dashboard with Visualization Tool Assignment**

**1)What is Power BI and how does it differ from Excel?**

Excel is your digital notebook. You can jot down data, make calculations, and create some basic charts. It's great for personal projects, managing a budget, or doing a quick analysis of a small amount of data. You're in total control of every cell, which is awesome for detailed work but can get messy fast.

Power BI is like a professional data reporter. You feed it huge amounts of information from all kinds of places (Excel files, online databases, etc.), and it automatically turns that data into beautiful, interactive dashboards and reports. You don't have to fiddle with individual cells. Instead, you get a big-picture, dynamic view of what's happening.

**2) Explain the concept of data modelling in Power BI?**

Data modelling in Power BI is like organizing your data to make it easier to understand and use. It's the process of connecting different tables of data and defining how they relate to each other. Instead of having a bunch of disconnected spreadsheets, you're building a single, cohesive database that Power BI can read and analyse efficiently.

**3) What are the different types of connections available in Power BI?**

There are three main types of connections available in Power BI: Import Mode, Direct Query, and Live Connection. Each method determines how Power BI accesses and processes data.

**4) How do you handle data transformation in Power BI?**

I handle data transformation in Power BI using Power Query Editor, a built-in tool that allows you to clean, shape, and prepare your data before it is loaded into the Power BI model. Power Query records every step of your transformations, allowing you to easily go back, modify, or replay the process.

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

DAX (Data Analysis Expressions) is a formula language used in Power BI to create custom calculations, measures, and columns from data in your model. It's essential for performing advanced analysis that goes beyond simple aggregations like sums or counts.

**6) Can you explain the difference between calculated columns and Measures in**

**Power BI?**

The primary difference between calculated columns and measures in Power BI lies in their timing of calculation and how they are stored in the data model. Both are created using DAX, but they serve different purposes.

**7) How do you handle relationships between tables in Power BI?**

To handle relationships between tables in Power BI, you use the Model view, which allows you to define how different tables are connected to one another. Power BI often detects and creates these relationships automatically, but you should always review them for accuracy.

**8) What is the purpose of a Power BI Gateway?**

A Power BI Gateway acts as a bridge or secure connection between Power BI's cloud service and on-premises data sources that aren't in the cloud. Its primary purpose is to allow Power BI to securely access, refresh, and use data from sources like a local SQL Server database, a file share on a company network, or a SharePoint site within a company's firewall.

**9) How can you schedule data refresh in Power BI Service?**

You can schedule a data refresh in the Power BI Service through the dataset's settings. After publishing a report from Power BI Desktop to the service, you navigate to the workspace, find the dataset associated with your report, and access its settings.

**10) Explain the concept of row-level security in Power BI.?**

Row-level security (RLS) in Power BI is a feature that restricts data access for specific users based on their login credentials. Instead of creating different reports for different users, RLS allows you to use a single report and dataset, and Power BI dynamically filters the data to show only what each user is permitted to see.

**16) Explain the difference between calculated columns and calculated tables in Power BI?**

### Calculated Columns: A calculated column is a new column added to an existing table in your data model. It's defined by a DAX expression that is evaluated row by row. Each row in the new column has a value based on the expression's logic and the context of the current row.

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**11) What is the Power BI Desktop and how does it differ from Power BI Service?**

Power BI Desktop is a free, Windows-based application that you download and install on your computer. It is the authoring tool for Power BI. This is where you do all the "heavy lifting": connecting to data sources, transforming and cleaning data with Power Query, building a data model with relationships and DAX, and creating reports with interactive visuals.

Power BI Service is a cloud-based platform accessible through a web browser. It is the sharing and collaboration hub. Once you've created a report in Power BI Desktop, you "publish" it to the Power BI Service. The service is where you can share your reports and dashboards with colleagues, set up scheduled data refreshes, and create dashboards. It's designed for viewing, consuming, and interacting with reports, not for creating complex data models

**12) Explain the concept of Direct Query in Power BI?**

Direct Query in Power BI is a data connectivity mode that connects directly to the data source without importing the data into Power BI's memory. Instead of storing a copy of the data, Power BI sends queries to the underlying database every time a user interacts with a report or visual.

**13) What are Power BI templates and how are they useful?**

Power BI templates (.pbit files) are a report file format that contains all the elements of a Power BI report—such as report pages, visuals, data model definitions, and queries—but without the actual data. They are essentially a blueprint for a report.

How They Are Useful:

* Standardization: Templates ensure consistency across reports within an organization. They can be used to enforce a standard look and feel, including consistent colour schemes, fonts, and chart types.
* Time-saving: By creating a template, developers can save time by not having to rebuild the same report structure from scratch. Users can simply open the template, connect to their data source, and have a fully-formatted report ready to go.
* Security and sharing: Because templates do not contain sensitive data, they are much smaller in size and safer to share. When a user opens a template, they are prompted to connect to the data source with their own credentials, ensuring data security.
* Easy to replicate: Templates are perfect for creating reports that are based on the same structure but for different data sources (e.g., a monthly sales report template that can be used for each sales region)

**14) How do you handle incremental data refresh in Power BI?**

Incremental refresh in Power BI is a feature that allows you to load only the new or changed data since the last refresh, instead of reloading the entire dataset. This is particularly useful for large datasets where a full refresh would be time-consuming and resource-intensive.

**15) What is the role of Power Query in Power BI?**

Power Query is a data connection and transformation tool used in Power BI. Its primary role is to connect to various data sources, and then clean, shape, and prepare the data before it is loaded into the Power BI data model for analysis.

**17) How do you create custom visuals in Power BI?**

Creating custom visuals in Power BI requires development skills and a specific toolset, as they are essentially web applications built to display data. This is different from simply using the visuals available in the AppSource library.

### The Development Process

1. Environment Setup: You first need to set up your development environment. This typically involves installing Node.js and the Power BI Visuals SDK (pbiviz) via the command line. These tools are what you'll use to create and package your visual.
2. Project Creation: Using the pbiviz command-line tool, you'll create a new project. This scaffolds a basic project structure with all the necessary files, including pbiviz.json (for metadata) and .ts (Typescript) files for the visual's logic.
3. Visual Logic and Design: This is the core of the development. Custom visuals are built using JavaScript or Typescript and often leverage other visualization libraries like D3.js or Vega/Vega-Lite. You'll write the code that handles how the visual receives data, how it processes that data, and how it renders it on the report canvas.
4. Testing and Debugging: During development, you can run the visual in a "developer mode" within Power BI to test it with your data and ensure it behaves as expected. The developer mode also provides a visual container and a panel to inspect the data view and debugging information.
5. Packaging and Distribution: Once the visual is complete, you use the pbiviz tool to package it into a .pbiviz file. This is the final, distributable file that can be imported into a Power BI report by you or other users in your organization.

**22) What is the purpose of Power BI Embedded and when would you use it?**

Power BI Embedded is a service that lets developers **embed interactive Power BI reports and dashboards into custom applications or websites**.  
It is used when businesses want to give **analytics and reporting features to users** inside their apps **without requiring a separate Power BI license** for every user.

**18) What are the best practices for optimizing performance in Power BI?**

**Best practices for optimizing Power BI performance:**

1. **Reduce data size** – Import only required columns/rows.
2. **Use star schema** instead of flat/wide tables.
3. **Avoid complex DAX** in visuals; create calculated columns/measures smartly.
4. **Aggregate data** where possible before loading.
5. **Disable auto date/time** for unused date columns.
6. **Use proper data types** (Integer, Date, Boolean).
7. **Optimize visuals** – fewer visuals per page, avoid unnecessary slicers.
8. **Enable query folding** in Power Query for efficiency.
9. **Use incremental refresh** for large datasets.
10. **Monitor with Performance Analyser** to detect slow visuals.

**19) How can you integrate Power BI with other Microsoft products like Azure and Office 365?**

**Power BI integration with Azure & Office 365:**

1. **Azure** – Connect to Azure SQL Database, Azure Data Lake, Synapse for data storage & analytics.
2. **Azure ML** – Use machine learning models in Power BI reports.
3. **Office 365** – Embed Power BI in **Teams, SharePoint, Excel, Outlook** for collaboration.
4. **Power Automate** – Automate workflows with Power BI alerts/actions.
5. **One Drive/SharePoint** – Auto-refresh reports from stored Excel/CSV files

**20) Explain the concept of aggregations in Power BI?**

Aggregations are **summarized tables** (like sum, average, count, min, max) created from large detailed data. Instead of querying millions of rows, Power BI uses the smaller aggregated table, which improves **performance and speed** while still allowing drill-down into detailed data when needed.

**21) How do you handle error handling and data quality in Power BI?**

**Error handling & data quality in Power BI:**

* Use **Power Query** to detect/remove errors, blanks, duplicates.
* Apply **data profiling tools** (column quality, distribution).
* Use **Replace Errors/Nulls** with defaults or transformations.
* Validate with **DAX measures** (e.g., ISBLANK, IFERROR).
* Ensure **data type consistency** and set rules before loading.