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| **SESSION** | **APRIL 2025** |
| **PROGRAM** | **MASTER OF COMPUTER APPLICATION (MCA)** |
| **SEMESTER** | **I** |
| **COURSE CODE & NAME** | **DCA6112 DATA VISUALIZATION** |
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**Assignment SET - I**

**1. a. Explain the importance of data visualization in today's data-driven world. Highlight at least three specific reasons with examples from real-life industries. 5**

**b. Explain how the knowledge of Excel can give you a competitive edge in today's data- driven world. Also explain the significance of data formatting in Excel and its impact on visual representation.**

**Ans 1.**

**a. Importance of Data Visualization in Today’s Data-Driven World**

**Enhances Data Comprehension**

Data visualization plays a crucial role in simplifying complex datasets by transforming them into visual formats like graphs, charts, and dashboards. In the age of big data, where organizations generate massive amounts of information daily, visualization helps convert raw data into actionable insights. One of the most important reasons data visualization is essential is that it enhances data comprehension. A graph or chart can make trends, patterns, and anomalies more visible than tables filled with numbers. For example, in the healthcare industry,

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**2. a. Explain how histograms help in identifying the distribution of data and compare at least two types of histograms with examples. 5**

**b. Describe the components of a box and whisker plot and explain how it is used for comparing datasets with its applications. 5**

**Ans 2.**

**a. Histograms and Their Role in Understanding Data Distribution**

**Frequency Distribution**

Histograms are a type of bar chart used to represent the frequency distribution of continuous numerical data. They help in visualizing how data is spread over a range of values, making it easier to identify patterns such as skewness, central tendency, and variability. In a histogram, data is divided into intervals or "bins," and the height of each bar shows how many data points fall within that range. This allows viewers to see where data is concentrated and where it is

**3. a. Explain the concept, benefits, and limitations of Word Clouds as a tool for text data visualization. Also explain fundamental, visualization techniques, tools and libraries related to Sentiment analysis visualization. 5**

**b. Describe the construction and interpretation of a Correlation Matrix. Also describe the types, applications and steps involved in creating Geographical Maps. 5**

**Ans 3.**

**a. Word Clouds and Sentiment Analysis Visualization Techniques**

**Concept, Benefits, and Limitations of Word Clouds**

A word cloud is a visual representation of textual data where the frequency or importance of each word determines its size or prominence in the image. Frequently occurring words appear larger and bolder, while less common words are shown in smaller fonts. Word clouds are a popular tool for quickly identifying the most common terms in a text corpus, making them useful in summarizing large volumes of unstructured data.

One of the primary benefits of word clouds is that they are visually appealing and provide a

**b. Correlation Matrix and Geographical Maps**

**Construction and Interpretation of a Correlation Matrix**

A correlation matrix is a table that displays the pairwise correlation coefficients between multiple variables in a dataset. Each cell in the matrix shows the strength and direction of the relationship between two variables, with values ranging from -1 to +1. A value close to +1 indicates a strong positive correlation, while a value close to -1 signifies a strong negative correlation. A value around 0 implies no linear correlation.

To construct a correlation matrix, statistical libraries such as Pandas in Python are commonly

**Assignment SET - II**

**4. a.Explain the construction and interpretation of Bubble Charts in Python using Plotly. How does 'squarify' assist in generating Tree Maps in Python? 5**

**b. Explain the importance of addressing missing values in a dataset and also Describe the common methods for detecting and handling missing data, providing examples for each.**

**Ans 4**

**a. Bubble Charts with Plotly and Tree Maps with Squarify**

**Construction and Interpretation of Bubble Charts in Python using Plotly**

Bubble charts are an extension of scatter plots, where a third dimension of data is represented by the size of the marker. They are particularly useful for comparing three variables at once—two along the x and y axes and one through the size of the bubble. **Plotly**, a powerful interactive visualization library in Python, enables easy creation of bubble charts using the scatter function

**5.a. (i) Explain the importance of time series data in data analysis. Give a brief detail of exploring a time series data in Python and mention the steps followed in Python to perform time series analysis.**

**(ii) Explain the significance of trend, seasonality, cyclical, and irregular components with suitable examples from real-world datasets. 5**

**b) Discuss the components of a 3D mesh and their roles in computer graphics and 3D modelling. Also explain syntax and parameters of constructing a 3D Mesh plot in Python.**

**Ans 5**

**a(i): Importance and Exploration of Time Series Data in Python**

**Importance of Time Series Data in Analysis**

Time series data consists of observations collected sequentially over time. It is vital in many fields such as finance, weather forecasting, economics, and healthcare. The primary importance of time series data is that it captures trends, patterns, and fluctuations over specific time intervals, allowing analysts to forecast future values and monitor changes. For instance, in stock market analysis, time series data helps predict future stock prices based on past

**b:**

**Components and Construction of 3D Mesh Plot in Python**

A 3D mesh in computer graphics is a collection of vertices, edges, and faces that defines the shape of a 3D object. The **vertices** represent points in 3D space. These points are connected by **edges**, and multiple edges form **faces**, which are typically triangular or quadrilateral. Together, these components create the surface geometry of a 3D model, enabling realistic rendering and simulation.

Meshes are essential in fields such as animation, gaming, medical imaging, and virtual reality.

**6.a. Explain the components and interactivity features of a data dashboard. How do these elements contribute to effective data analysis and decision-making?**

**b. Explain the process of dashboard development using Dash and Plotly. Also explain steps for crafting a data story in story development stage.**

**Ans 6a.**

**Components and Interactivity in Data Dashboards**

**Components of a Data Dashboard**

A data dashboard is an interactive visual interface that displays key metrics, trends, and insights in real-time. The core components include charts and graphs, which visually present data through line graphs, bar charts, pie charts, and scatter plots. Filters and dropdown menus allow users to refine views by selecting specific time periods, regions, or categories.

Another important element is the KPI (Key Performance Indicator) cards, which display vital

**Ans 6b.**

**Dashboard Development Using Dash and Plotly**

**Steps for Dashboard Development in Dash and Plotly**

Dash is a Python framework developed by Plotly for building interactive dashboards and web-based data applications. It integrates seamlessly with Plotly for visualization and Flask for web interface rendering. The development process begins by installing Dash and Plotly libraries, followed by importing them in the script.

The first step is to **create the layout** using Dash’s HTML and core components like dcc.Graph,