Design Guidelines in Data Visualization

Instructions:

- Answer all questions thoroughly with relevant examples.
- Provide clear explanations and use diagrams where necessary.
- Use external references if needed but ensure originality.
- Submit in **Word format**
- Ensure professional formatting and concise answers.
- **Plagiarism will result in mark deductions**.

Section 1: Principles of Data Visualization

1.1 Fundamental Design Guidelines *(10 marks)*
a) Explain how selecting the best visual channel impacts the effectiveness of a visualization.
b) Discuss the importance of displaying data accurately and completely.
c) Why is proper labeling and clear annotation essential in visualization? Provide an example.

1.2 Graphical Integrity & Misrepresentation *(10 marks)*
a) Define the concept of graphical integrity and explain how it can be violated.
b) Discuss the role of the **Lie Factor** in misleading visualizations.
c) Find and critique an example of a visualization that misrepresents data.

Section 2: Scaling, Framing, and Bias in Visualization

2.1 Scaling & Logarithmic Representation *(10 marks)*
a) Explain the importance of maintaining appropriate scales in bar charts.
b) Discuss scenarios where a logarithmic scale is preferred over a linear scale.
c) How can improper scaling lead to misinterpretation of trends? Provide an example.

2.2 Framing & Bias *(10 marks)*
a) How does framing influence perception in data visualization?
b) Provide an example of biased framing in a real-world dataset.
c) Suggest ways to reduce bias in visual storytelling.

Section 3: Chart Selection & Visual Best Practices

3.1 Choosing the Right Chart Type *(10 marks)*
a) Compare the effectiveness of bar charts, line charts, and scatter plots for different data types.
b) Why are pie charts often discouraged? What are better alternatives?
c) Provide an example where a stacked bar chart is more effective than a grouped bar chart.

3.2 Data-Ink Ratio & Chart Junk *(10 marks)*
a) Define the Data-Ink Ratio and discuss its significance in visualization.
b) Identify and analyze an example of excessive "chart junk" in a visualization.
c) Suggest best practices for improving clarity and readability in complex charts.

Section 4: Advanced Visualization Techniques

4.1 3D Visualizations & Their Limitations *(10 marks)*
a) Discuss the disadvantages of using 3D charts in data visualization.
b) What are alternative methods for representing multi-dimensional data without using 3D?
c) Provide an example where a 3D visualization was misleading and suggest improvements.

4.2 Time-Series Visualization & Small Multiples *(10 marks)*
a) Compare the effectiveness of animated visualizations versus small multiples.
b) How does "Eyes Beat Memory" apply to time-series analysis?
c) Give an example where small multiples would be preferred over an animated chart.

Section 5: Application & Ethical Considerations

5.1 Real-World Dashboard Analysis *(5 marks)*
a) Select a publicly available data dashboard and evaluate its design effectiveness.
b) Identify strengths and weaknesses in its visual presentation.
c) Suggest three specific improvements to enhance clarity and user engagement.

5.2 Ethics & Trust in Data Visualization *(5 marks)*
a) Discuss ethical considerations in data visualization.
b) Provide an example where data visualization was used unethically in media or business.
c) Propose guidelines to maintain trust and integrity in visual storytelling.

AI driven Data Visualization Tool (10 marks)

Identify an **AI-driven data visualization tool** and evaluate how it improves insights compared to traditional static charts.