Business Analytics and Data Science

1. **How can businesses leverage descriptive, diagnostic, predictive, and prescriptive analytics to drive strategic decisions?**
2. **Provide examples of descriptive, diagnostic, predictive, and prescriptive analytics in college recruitments.**
3. **Provide examples of descriptive, diagnostic, predictive, and prescriptive analytics in monitoring air quality.**
4. **Which type of analytics is best suited for sales forecasting, and why?**
5. **What is the significance of data visualization in analytics, and what are some common techniques used?**

Social Network and Graph Analysis

6. **List five examples of social network analytics using graphs.**
7. **Explain how a social network like LinkedIn or Facebook can be represented as a graph, and list the types of communities, relationships, analytics, and their advantages.**
8. **What types of graph analyses can be performed on a social network like Twitter? List five and describe their benefits.**
9. **What are the advantages of representing social networks as graphs?**
10. **Explain the concepts of Hub nodes, Authority nodes, and SimRank. How is SimRank calculated using a simplified node pair graph?**
11. **Describe the clustering of social-network graphs.**
12. **Explain the concept of locality in social media graphs.**

Geographic Information Systems (GIS)

13. **Trace the evolution of GIS and list popular open-source GIS software.**
14. **What are the roles of GIS in sustainability planning and environmental conservation?**
15. **How do GIS tools aid in solving real-world geographical and environmental problems?**
16. **Explain and compare DEM (Digital Elevation Model), DSM (Digital Surface Model), and DTM (Digital Terrain Model).**
17. **Describe contours and Triangulated Irregular Networks (TIN).**
18. **Compare raster and vector data models in GIS and their applications.**
19. **Analyze the process of converting vector data to raster data and vice versa, with examples of their applications.**

20. **Discuss the applications of terrain analysis and explain the significance of slope and aspect in environmental planning.**

Time Series and Forecasting

21. **Compare additive and multiplicative seasonal models in time series forecasting. When should each be used?**
22. **Describe the Random Walk Model for time series analysis.**
23. **Explain the concept of State Space Models in time series analysis with an example.**
24. **What are the key considerations when simulating time series data, and why is simulation important?**
25. **What are some common exploratory data analysis (EDA) techniques for time series data?**
26. **Explain the difference between upsampling and downsampling in time series data. When is each technique used?**
27. **Using the given time series data, forecast future values using exponential smoothing with a specified alpha.**
28. **Calculate a three-month moving average forecast using the provided dataset for visitor numbers or sales.**
29. **Explain the main challenges in finding and wrangling time series data.**

Statistical Analysis

30. **Calculate the range, variance, and standard deviation of a given dataset.**
31. **Find the interquartile range (IQR) of a dataset and identify any outliers using the 1.5 * IQR rule.**
32. **Test for randomness in a sequence (e.g., customer arrivals or ticket holders) using a significance level of $\alpha = 0.05$.**
33. **Calculate the percentage growth, average revenue, and identify the highest revenue growth from a company's quarterly data.**

Healthcare Analytics and NLP

34. **Explain how Natural Language Processing (NLP) is used to analyze clinical text data.**
35. **What are the main benefits of mining clinical text data for healthcare providers and patients? Provide examples.**
36. **Discuss the challenges in processing clinical reports using NLP and data mining techniques.**
37. **What types of data can be mined from medical sensors? Provide examples of sensors and their outputs.**

38. **Define an Electronic Health Record (EHR) and outline its primary components.**
39. **Discuss two key benefits of implementing EHR systems in healthcare with examples.**
40. **Identify two major barriers to adopting EHR systems in healthcare and explain their impact on healthcare delivery.**

Miscellaneous

41. **Explain feature manipulation in vector analysis, such as clipping and dissolving.**
42. **Discuss the significance of topology in vector data models.**
43. **Compare and contrast directed and undirected graphs with real-world examples.**
44. **Explain collaborative social networks with an example.**