ANSWER KEY   Register Number:………….

M.TECH DEGREE EXAMINATIONS: Nov/Dec 2024

(Regulation 2018)

Second Semester

DATA SCIENCE

P18ITI2206 : Data Visualisation

COURSE OUTCOMES

CO1: Explain principles of visual perception

CO2: Apply core skills for visual analysis.

CO3: Describe visualization for time-series analysis and ranking analysis.

CO4: Explain visualization for deviation analysis and distribution analysis

CO5: Describe visualization for correlation analysis and multivariate analysis

CO6: Summarize issues and best practices in information dashboard design.

Time: Three Hours   **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Assertion (A): People are more likely to notice color changes than shape changes in a   CO1   [K2]
    visualization.

    Reason (R): Color is a more attention-grabbing feature in visual perception.

    a)   Both A and R are individually true and   b)   Both A and R are individually true but
         R is the correct explanation of A   R is not the correct explanation of A

    c)   A is true but R is false   d)   A is false but R is true

2. Which of the following is a key objective of data visualization?   CO1   [K2]

    a)   Increase data redundancy   b)   Identify hidden patterns in data

    c)   Reduce data storage   d)   Increase the size of the dataset

3. Assertion (A): The 80:20 rule of distribution is often used in reference to a company's   CO2   [K3]
    revenue

    Reason (R): stating that 80% of the revenue comes from 20% of the customers.

    a)   Both A and R are individually true and   b)   Both A and R are individually true but
         R is the correct explanation of A   R is not the correct explanation of A

    c)   A is true but R is false   d)   A is false but R is true

4. Matching type item with multiple choice code   CO1   [K3]

List I	List II
A. Nominal	i. Comparing measures that were recorded at different points in time.
B. Ranking	ii. Comparing difference between two sets of values
C. Deviation	iii. Comparing values that are arranged by magnitude
D. Time-series	iv. Comparing values that have no particular order

	A	B	C	D
a)	iv	iii	ii	i
b)	iv	iii	i	ii
c)	iii	iv	ii	ii
d)	iii	iv	I	ii

5. Assertion (A): Trellis displays allow for the comparison of multiple variables in a dataset.   CO2   [K2]

   Reason (R): They create a grid of small plots, each representing a subset of the data.

   a) Both A and R are individually true and R is the correct explanation of A
   b) Both A and R are individually true but R is not the correct explanation of A
   c) A is true but R is false
   d) A is false but R is true

6. Which graph is suitable for cyclic data?   CO2   [K2]

   a) Dot
   b) Box
   c) Radar
   d) Pareto

7. Which of the following methods are used to display trend lines?   CO3   [K2]
   i. Linear regression
   ii. Running averages
   iii. Mode value
   iv. Median values

   a) (i),(ii),(iii),(iv)
   b) (i),(ii),(iii) only
   c) (i),(ii) only
   d) (i) only

8. In data dashboards, which of the following is the common method for displaying KPIs (Key Performance Indicators)?   CO4   [K3]

   a) Pie Charts
   b) Bullet Graphs
   c) Heat maps
   d) Tree Maps

9. Which of the following is the key advantage of using interactive dashboards?   CO4   [K2]

   a) Displaying more data points
   b) Reducing the complexity of data
   c) Allowing users to manipulate and explore data in real-time
   d) Increasing data security

10. Which of the following are examples of Glyphs?   CO3   [K2]
    i. Human face
    ii. Whiskers
    iii. Stars
    iv. Coordinates plots

    a) (i),(ii),(iii),(iv)
    b) (i),(ii) only
   c) (ii),(iii) only
    d) (i),(ii),(iii) only

PART B (10 x 2 = 20 Marks)

11. Differentiate between exploratory and explanatory analysis.   CO1   [K2]

12. List any four traits of meaningful data.   CO1   [K2]

13. Draw a stem and leaf plot for the following list of items.   CO2   [K3]

    71, 43, 65, 76, 98, 82, 95, 83, 84, 96.

14.	Write down any four data visualization tools.	CO2	[K2]
15.	What are the key characteristics of correlation analysis?	CO3	[K2]
16.	Compare Linear correlation coefficient (r) with Coefficient of determination (r^2)	CO3	[K3]
17.	What are the three different types of memory?	CO4	[K1]
18.	How can heat maps be used for visualizing correlations between variables?	CO4	[K2]
19.	Compare analytical and operational dashboards.	CO4	[K2]
20.	List and explain various categories of libraries available for dashboard display media	CO5	[K2]

PART C (10 x 5 = 50 Marks)

21.	What do you mean by over-plotting? Explain the methods to reduce over-plotting.	CO1	[K2]
22.	What do you mean by pre-attentive attributes? List and explain.	CO4	[K2]
23.	Which graph makes it easier to determine district wise productions? Justify your answer with a detailed explanation.	CO2	[K3]
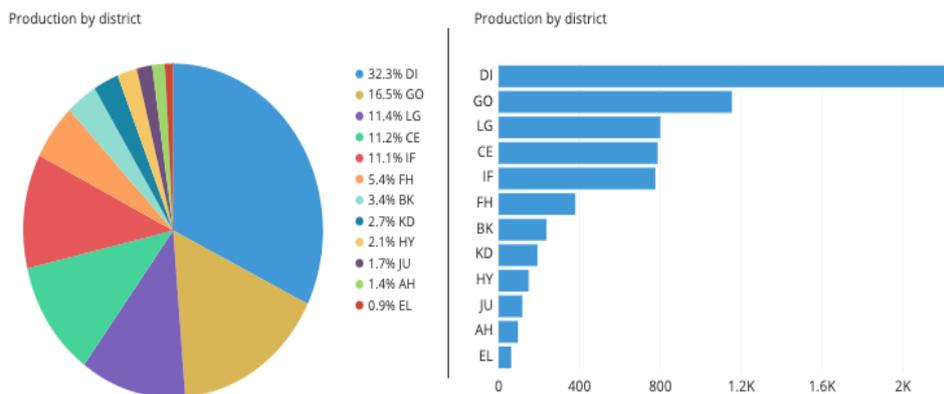
24.	Explain the concept of trellises and crosstabs and how they aid in visual analysis.	CO2	[K2]
25.	What do you mean by deviation analysis? Explain the best practices used in the deviation analysis	CO2	[K2]
26.	Draw the bump chart for the following data and also write your interpretation.	CO2	[K3]

Country	Rank		
	2011	2012	2013
Finland	1	4	3
Germany	2	3	1
Sweden	3	1	4
India	4	2	2

27.	What is box plot? Construct a box plot for the following data. Mention median, lower quartile and upper quartile.	CO3	[K3]

      (1) 59, 60, 61, 62, 62, 63, 63, 64, 64, 64, 65, 65, 65, 65, 65, 65, 65, 65, 65, 66, 66, 67, 67, 68, 68, 69, 70, 70, 70, 70, 70, 71, 71, 72, 72, 73, 74, 74, 75, 77

      (2) 1, 1, 2, 2, 4, 6, 6.8, 7.2, 8, 8.3, 9, 10, 10, 11.5

28.	List and explain common pitfalls in dashboard design	CO4	[K2]
29.	What do you mean by multivariate analysis? With an example explain in detail about multivariate patterns, displays and best practices.	CO4	[K3]
30.	List the Gestalt Principles of Visual Perception and explain each principle.	CO4	[K2]

Answer any TWO Questions
PART D (2 x 10 = 20 Marks)

31. What are the different types of analytical interactions that are useful when analyzing data? Explain   CO1   [K3]

32. With an example explain in detail about correlation patterns, displays and best practices.   CO3   [K2]

33. Design an interactive dashboard to visualize student performance in an engineering institution. The dashboard should include the following elements: CO5   [K3]

  - Display the overall academic performance of students across various departments (e.g., CSE, ECE, ME) over multiple semesters.
  - Include a **time-series analysis** to show trends in performance over time (e.g., semester-wise GPA trends).
  - Provide **distribution analysis** to highlight grade distributions in each department.
  - Implement **correlation analysis** to compare student attendance and academic performance.
  - Design **ranking displays** to show the top-performing students across departments.

Discuss the design choices you make, the data you will require, and how the dashboard can provide meaningful insights for administrators and faculty.

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