Enrollment No.....................................

Faculty of Engineering
End Sem Examination Dec 2024
ME3CO48 Data Science for Mechanical Engineers

Programme: B.Tech.   Branch/Specialisation: ME

Duration: 3 Hrs.   **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

			Marks	BL	PO	CO	PSO
Q.1	i.	The ACID properties ensure database reliability. What does the C in ACID stand for? (a) Continuity (b) Corruption (c) Consistency (d) Coherence	1	1	1	1	1
	ii.	Which key constraint ensures that no two rows can have the same value in a particular column? (a) Foreign key (b) Primary key (c) Unique key (d) Composite key	1	1	1	1	1
	iii.	Which of the following techniques is used to convert categorical data into numerical data by assigning unique integer values to each category? (a) Standardization (b) Label encoding (c) One hot encoding (d) Normalization	1	2	2	2	1
	iv.	One hot encoding is used when: (a) The data contains only numerical values (b) The categorical data is ordinal in nature (c) The categorical data has no inherent order (d) The data needs to be standardized	1	1	2	2	1
	v.	Which type of plot in Seaborn can help in visualizing correlations among multiple variables? (a) Heatmap (b) Pie chart (c) Histogram (d) Strip plot	1	1	1	3	1

P.T.O.

vi. Which of the following is an advantage of interactive visualizations? **1**   2   1   3   1
    (a) Simplicity in design
    (b) Real-time data exploration
    (c) Limited interactivity
    (d) Static representation

vii. Which type of data is commonly collected for condition monitoring? **1**   2   2   4   1
    (a) Temperature, vibration, noise
    (b) Market trends, competitor analysis
    (c) Financial data
    (d) Employee performance metrics

viii. What is the purpose of a decision support system in mechanical engineering? **1**   2   2   4   1
    (a) To automate routine tasks
    (b) To provide information and recommendations for decision-making
    (c) To control manufacturing processes
    (d) To perform simulations

ix. Amongst which of the following is a component of data privacy? **1**   2   2   5   1
    (a) Management of data risk
    (b) Data loss prevention
    (c) Password management
    (d) All of these

x. What legal principle involves organizations being responsible for the personal data they collect and process? **1**   2   1   5   1
    (a) Data ownership
    (b) Data security
    (c) Data accountability
    (d) Data transparency

Q.2 i. Write some important applications of data science in field of mechanical engineering. **3**   2   1   1   1

ii. Explain the concept of keys (Primary, Foreign, and Composite) in relational databases. **7**   2   1   1   1

OR iii. Discuss the ACID properties of a database. How do these properties ensure data reliability and integrity? **7**   2   1   1   1

Q.3 i. What are the main challenges faced in statistical data analysis in real-world datasets? **4**   1   1   2   1

ii. Enlist different types of data analysis techniques and explain any one of them with real life example. **6**   1   1   2   1

OR iii. Define Exploratory Data Analysis (EDA). Discuss its role in the data analysis process. Explain how EDA can help identify patterns, trends, and anomalies in a dataset. **6**   2   2   2   1

Q.4 i. Define data visualization. Explain different types of techniques used for it. **3**   2   2   3   1

ii. Compare and contrast Matplotlib and Seaborn in terms of their use cases, functionality, pros and cons. **7**   2   2   3   1

OR iii. Explain various graphic visualization that can be drawn using matplotlib library. **7**   2   2   3   1

Q.5 i. Explain the key differences between condition monitoring and predictive maintenance. **4**   2   1   4   1

ii. Define fault diagnosis. Explain the role of data science in fault diagnosis. **6**   2   1   4   1

OR iii. Explain the process of predictive maintenance in detail. **6**   2   1   4   1

Q.6   Attempt any two:

i. What measure does your organisation take to ensure the confidentiality, integrity and availability of sensitive data? **5**   2   1   5   1

ii. What is data protection regulation? Explain any one in details. **5**   2   1   5   1

iii. Write short note on critical ethical concerns in data science. **5**   2   1   5   1

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Marking Scheme
ME3CO48 (T) Data Science for Mechanical Engineers (T)

Q.1 i)   C. Consistency   1

     ii)   C. Unique Key   1

     iii) B. Label Encoding   1

     iv)   C. The categorical data has no inherent order   1

     v)   a) Heatmap   1

     vi)   b) Real-time data exploration   1

     vii) a) Temperature, vibration, noise   1

     viii) b) To provide information and recommendations for decision- 1
           making
     ix)   d) All of the above   1

     x)   b) Data Security   1

Q.2 i.   Applications of data science in field of mechanical engineering. 3
           3*1
     ii.   Concept of Primary keys,   2.5 Marks   7
           Concept of Foreign keys   2.5 Marks
           Concept of Composite keys   2 Marks
OR   iii. Explanation of ACID properties of a database.   3.5 Marks   7
           Explanation to ensure data reliability and integrity? 3.5 Marks

Q.3 i.   One Mark for one challenges   2 Marks   4
           Example of real-world datasets?   2 Marks
     ii.   Different types of data analysis techniques   2 Marks   6
           Explanation of any one of technique with real life example.
                                                  4 Marks
OR   iii. Define Exploratory Data Analysis (EDA).   2 Marks   6
           Discuss its role in the data analysis process   2 Marks
           Explain how EDA work for given case.   2 Marks

Q.4 i.   Define data Visualization   1.5 Marks   3
           Explanation of different types of techniques   1.5 Marks
     ii.   Each point of comparison carry One Mark 7*1   7

OR   iii. Each graphic visualization technique carry   7
           2 marks*3   6 Marks
           Name of Types of techniques   1 Mark

Q.5 i.   Each difference carry equal marks*4   4

     ii.   Definition of fault diagnosis.   2 Marks   6
           Role of data science in fault diagnosis.   4 Marks
OR   iii. Process of predictive maintenance in detail.   6

Q.6 i.   Confidentiality of data   2 Marks   5
           Integrity of data   1.5 Marks
           Availability of sensitive data   1.5 Marks
     ii.   Data protection regulation?   2 Marks   5
           Explanation any one in details.   3 Marks
     iii. Each point carry equal marks*1   5

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