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| **Sem: Dec-2024**  **Maximum Marks: 50 Examination: End Exam Date:8/12/24 Duration: 2.5hrs** | | |
| **Programme code: 18**  **Programme: MBA for Working Executive** | **Class:** FY | **Semester: III**  **Batch- 2023-24** |
| **College:**  **K. J. Somaiya Institute of Management** | **Name of the department/Section/Center: DST** | |
| **Course Code:** 117P18C332 | **Name of the Course:** AI and ML in Operations | |
| **Instructions:**  **1. Question No. 1 is compulsory.**  **2. Attempt any four from Q.2 to Q.6** | | |

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| **Question No.** |  | **Max.**  **Marks** |
| Q1. | a) Distinguish between supervised learning and Reinforcement learning.  Illustrate with an example.  b) What is the Naïve Bayes algorithm, and how does it work? Why the algorithm is called "Naïve" Bayes? What are the advantages and disadvantages of Naïve Bayes? | (05)  (05) |
| Q2. | **Case Study: Improving Demand Forecasting in a Retail Supply Chain**  A retail chain, ShopSmart, faces challenges in accurately forecasting demand for its products, leading to stock outs and overstock situations. The operations team wants to use supervised machine learning to predict product demand for the next week using historical sales data and other factors like promotions, holidays, and weather.  The dataset contains the following columns:   1. **Date**: Week start date. 2. **Product\_ID**: Unique identifier for the product. 3. **Store\_ID**: Unique identifier for the store. 4. **Historical\_Demand**: Number of units sold in the past week. 5. **Price**: Selling price of the product. 6. **Promotion**: 1 if the product was on promotion, 0 otherwise. 7. **Holiday**: 1 if it was a holiday week, 0 otherwise. 8. **Weather\_Score**: A normalized score indicating weather conditions (higher is better). 9. **Next\_Week\_Demand**: Target variable (demand for next week). 10. How does data preprocessing impact the accuracy of the model? 11. What features were most important for demand forecasting? Why? 12. How could this model be integrated into the company’s operations strategy? 13. What are the potential challenges in using machine learning for demand forecasting in real-world scenarios? | (10) |
| Q3. | a) What are some creative applications of AI in entertainment, such as music and movie recommendations?  b) What is a random forest, and how is it different from a decision tree? How does the random forest algorithm reduce overfitting compared to a single decision tree? Explain with an example. | (05)  (05) |
| Q4. | a) Apply the KNN classification algorithm to the following data and predict the  value for (10,7) for K=3.   |  |  |  | | --- | --- | --- | | Feature 1 | Feature 2 | Class | | 1 | 1 | A | | 2 | 3 | A | | 2 | 4 | A | | 5 | 3 | A | | 8 | 6 | B | | 8 | 8 | B | | 9 | 6 | B | | 11 | 7 | B |   b) What are the advantages and disadvantages of different types of machine learning algorithms? | (05)  (05) |
| Q5. | a) Compare Feature Extraction and Feature Selection techniques. Explain how dimensionality can be reduced using a subset selection procedure.  b) What is over-fitting? When does it happen? How can we avoid over-fitting? | (05)  (05) |
| Q6. | **Case Study Warehouse Space Optimization**  **A large e-commerce company is facing inefficiencies in warehouse management, especially in optimizing the use of space for storing products. The company wants to use machine learning to optimize warehouse layout and product placement based on order patterns and product characteristics.**  **Questions:**   1. Which machine learning technique would you use to cluster products based on their order frequency and size? 2. How can clustering improve warehouse space optimization and operational efficiency? 3. If you notice that some products are frequently ordered together, how would this information to optimize storage layout? 4. What challenges might arise when applying unsupervised learning algorithms in this context? | (10) |