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**JAIPURIA INSTITUTE OF MANAGEMENT, NOIDA**

**PGDM / PGDM (M) / PGDM (SM)**

**FIFTH TRIMESTER (Batch 2022-24)**

**END TERM EXAMINATIONS, JANUARY 2024**

**SET – 1 (Group 1)**

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| --- | --- | --- | --- |
| Course Name | Machine Learning | Course Code | **20827** |
| Max. Time | **2 hours** | Max. Marks | **40 MM** |

**INSTRUCTIONS:**

1. There are two sections in the question paper. Both are compulsory to attempt.
2. It’s a pen and paper exam. Answer all questions on the answer sheet provided to you.
3. For Section B refer to the Annexure given with the question paper.

**Section A**

1. Read the following case let and answer the questions given at the end of the case:

**Case: The Dream Employee**

A group of MBA students from management institute in Delhi attended a conclave on “Demystifying Artificial Intelligence”. The event featured a panel of experts specializing in artificial intelligence, machine learning, data science, and analytics who shared insights into their experiences and ongoing projects.

One of the sessions focused on exploring the applications of Machine Learning in the e-commerce sector. The panel experts discussed various aspects, including the significance of analyzing digital information for effective decision-making. The experts from marketing, finance, HR and operations domains addressed the relevance of these technologies in their respective jobs in e-commerce sector.

They reiterated in many ways that a **dream employee** is one who has the domain expertise, which comes with time and experience, can look at varied sources of data to suggest means for filtering out relevant information, is able to suggest the analytical techniques to process the data and finally read and communicate the outcomes for its appropriate use in decision-making. The experts acknowledged that finding a resource possessing all these qualities is challenging. However, they stressed that in the future as we move towards a paperless environment, such muti-talented individuals will be highly valued. Therefore, efforts should be made to cultivate and enhance these capabilities.

**Answer the following questions based on the above case let:**

1. Recommend the kind of capabilities and the skills to be possessed by an individual wanting to join the Marketing department of an e-commerce company. **(5 Marks)**
2. Discuss two challenges/ problems in e-commerce business which can be resolved by applying machine learning algorithms. **(5 Marks)**
3. Techsolution, a call center in Noida, sent selected employees for a training program to enhance their efficiency and productivity. After the training the productivity of employees was measured by estimating the number of leads converted in the last quarter. The data is provided in the table below. Upon analysis, the team of analysts identified a missing in the dataset. Consequently, it is imperative to address this issue before constructing a machine learning model. Your task is to develop a method for handling the missing value (marked as XXX). Elaborate on your chosen method for treating missing values using the given data, which consists of seven rows. (**5** **marks**)

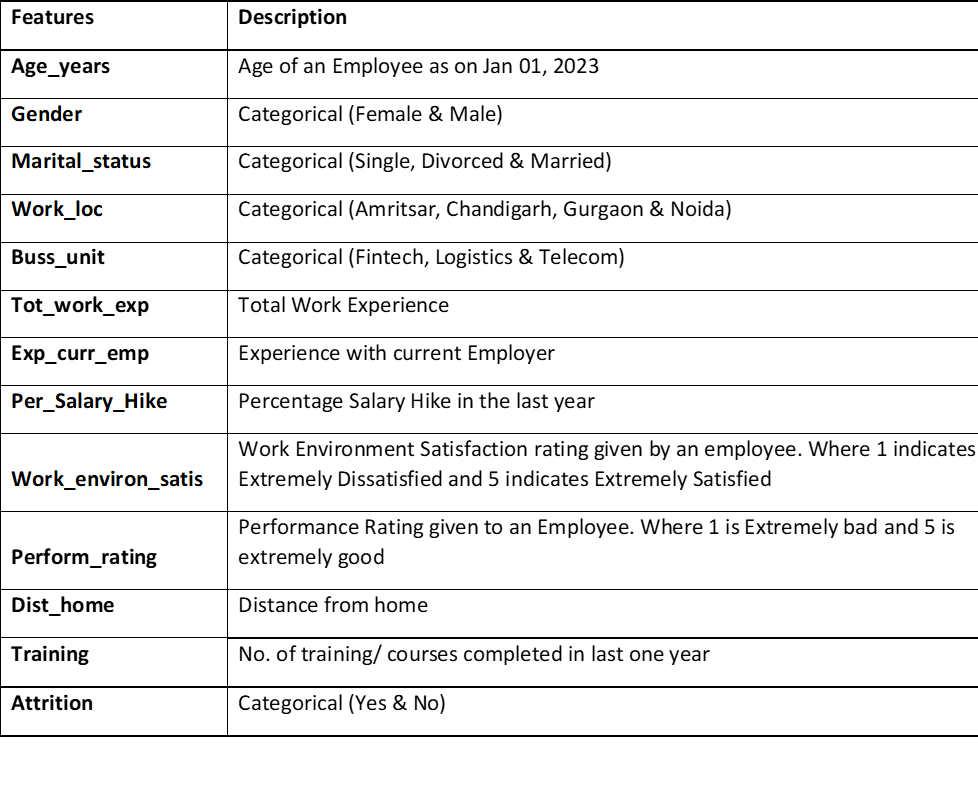
|  |  |
| --- | --- |
| **Employee** | **Productivity** |
| Sonia | 50 |
| Kanika | 80 |
| Rahul | 92 |
| Jessica | 85 |
| Mohit | 45 |
| Rohit | XXX - missing |
| Sachin | 87 |

**Section B**

1. **Read the following case:**

**Employee attrition Case**

HR analytics is the process of gathering and analysing Human Resource (HR) data in order to improve an organization’s workforce performance. In HR, attrition, is a term used to indicate voluntary departure of employees from a company. You are working as machine learning analyst for a Business Process Outsourcing (BPO) company. Your task is to classify which employee is likely to leave the company in the near future, based on data collected about the employees. The data description is given below:



Analyze the case using python codes and output enclosed with the question paper and answer the following questions:

**Q1.** Discuss the steps to build a machine learning model for solving the above business problem? **(5 marks)**

**Q2.** Estimate the number of features given for the above problem? **(1 mark)**

**Q3.** Which region has the minimum attrition rate? Justify by giving the valid reason.  **(2 marks)**

**Q4.** In your opinion which department has the least number of employees working? **(1 mark)**

**Q5.** What percentage of employees received a percent salary hike of more than 18%? **(1 mark)**

**Q6.** Refer to the confusion matrix of logistic regression model and determine the following values:

1. True Positive (TP) - \_\_\_\_\_\_\_\_\_\_
2. False Positive (FP) - \_\_\_\_\_\_\_\_\_\_
3. False Negative (FN) - \_\_\_\_\_\_\_\_\_\_
4. True Negative (TN) - \_\_\_\_\_\_\_\_\_\_
5. Accuracy - \_\_\_\_\_\_\_\_\_\_

Further, discuss how the values of precision, recall and f1-score are calculated and their relevance in context to the business problem. **(5 marks)**

**Q7.** Highlight the best algorithm for this problem? **(2 marks)**

**Q8.** Determine the optimal parameters of the best algorithm. **(2 marks)**

**Q9.** Discuss the importance of grid-search CV in machine learning? **(3 marks)**

**Q10**. Discuss graphically how the clustering algorithm works for segmenting customers. **(3 marks)**