**Practical Application of Supervised and Unsupervised Learning**

Total Marks: 20

### **Task 1: Classification Algorithms (8 marks)**

* Logistic Regression Implementation (2 marks):
  + Implement a logistic regression model using a provided dataset.
  + Evaluate the model's performance using appropriate metrics.
* Support Vector Machine Implementation (2 marks):
  + Apply a Support Vector Machine (SVM) classifier to the same dataset.
  + Compare and contrast the results with logistic regression.
* Random Forest Application (2 marks):
  + Implement a Random Forest classifier with a different dataset.
  + Discuss scenarios where Random Forest might outperform other classifiers.
* Ensemble Model Experimentation (2 marks):
  + Combine the models from tasks 1 and 2 using ensemble techniques (e.g., Voting Classifier).
  + Evaluate the ensemble model's performance and explain any observed improvements.

### **Task 2: More on Regression (5 marks)**

* Polynomial Regression Implementation (2 marks):
  + Apply Polynomial Regression to a given dataset with non-linear patterns.
  + Visualize the regression curve and interpret the results.
* Ridge and Lasso Regression (3 marks):
  + Implement Ridge and Lasso Regression on a dataset with multicollinearity.
  + Discuss the impact of regularization on model coefficients and overall performance.

### **Task 3: Introduction to Unsupervised Learning (7 marks)**

* K-Means Clustering Implementation (2 marks):
  + Implement the K-Means clustering algorithm on a provided dataset.
  + Visualize the clustered data and discuss the choice of the number of clusters (k).
* Mean Shift Clustering Experiment (2 marks):
  + Apply Mean Shift clustering to a different dataset.
  + Analyze the adaptability of Mean Shift to data density and distribution.
* Hierarchical Clustering Visualization (3 marks):
  + Implement hierarchical clustering with a dataset suitable for hierarchical structures.
  + Create and interpret a dendrogram to represent data relationships.
* Clustering Comparison (2 marks):
  + Compare and contrast the results of K-Means, Mean Shift, and Hierarchical Clustering in terms of interpretability and use cases.

### **Submission Guidelines (1 mark)**

* Jupyter Notebook Submission (1 mark):
  + Organize the tasks into a Jupyter Notebook with appropriate headings, code cells, and markdown explanations.
  + Include comments in the code cells for clarity.