END SEM exam of ME781 (take-home exam to be submitted by Dec 17 2020)

You need to upload the following:

1. Original python code for all the questions (separate files)

2. A power-point presentation of all the figures of the results with a **very brief** description (one-line description).

You will be provided a link to generate a unique dataset for each question.

Question 1: Fit a non-linear regression (for degree=2,3,4,5, and 6) model for the predictor (X) in the data. Compare the non-linear regression model with the KNN (for K=1,2,3,5,7). Use LOOCV to calculate MSE for this comparison.

Output required:

| 4+1 |
a.) Plot of mean squared error (for both training and testing) vs degree of the polynomial for the polynomial regression

| 4+1 |
b.) Plot of mean squared error (for both training and testing) vs k for KNN regression

Question 2: Perform classification using decision tree and linear support vector machine for the three-dimensional data.

Output required:

| 6 + 5 |
a.) Plot of three-dimensional decision boundaries of the two classifiers

| 1+1+1+1 |
b.) Confusion Matrix for the two classifiers

Question 3: Perform principal component analysis for the given six predictors in the data.

Output required:

| 5 |
a.) provide a plot of variance contained in principal components vs the number of principal components

| 5 |
b.) for three random data points, show (in a table format) how much is the difference between the actual data (original 6-dimensional data) vs data obtained by the back transformation from a reduced principal components space of five dimensions to 6 dimensions.