**Regression, Response Surface, & Taguchi Methods**

**PART 1 – DATA ANALYSIS**

Download the provided Excel data file and complete the following analysis using Minitab software

**1.** Data Exploration

a. Create a descriptive statistics table that includes all potential variables and discuss the results.

b. Create a matrix scatter plot and discuss any notable relationships. In particular, note bivariate pairs with

strong linear relationships or distinct nonlinear relationships.

c. Conduct bivariate correlation analysis and identify any strong (i.e., correlation coefficient value exceeds ±0.65), statistically significant correlations.

d. Discuss the implications of these results for regression modeling. In particular, discuss whether you expect a well-fitting regression model would be linear or nonlinear and which factors are most likely to affect ***Quality.***

**2**. Investigating Relationships

a. Considering the results of the data exploration, select one continuous factor that appears to be associated with ***Quality*** (you must justify your selection). Using the Fitted Line Plot tool in Minitab (or comparable approach, if approved), develop three regression models using this single factor (i.e., simple linear, quadradic, and cubic) and compare the relative fit of each model. Discuss the insights gained regarding the nature of the relationship between the selected factor and ***Quality***.

**3.** Regression Modeling

a. Create a multiple linear regression model that includes all potential factors (i.e., main effects only) and use a backward selection approach to reduce the model. Discuss the results including assessing model fit and validity and discussing the results of the residual analysis.

b. Create a second-order regression model with interactions that includes all potential factors and use a backward selection approach to reduce the model. Discuss the results including assessing model fit and validity and discussing the results of the residual analysis.

***Submit a Technical Report*** that addresses each of the prompts above in a **separate, clearly-labeled** sub-section. Each response should 1) describe and justify your approach, 2) summarize the statistical results, 3) identify any potential limitations, and 4) discuss your conclusions, insights, and recommendations.

• The report must follow APA formatting requirements and may not exceed 10 pages (excluding appendices).

• The report should be in narrative form appropriate for reporting to a client or supervisor.

• Only include images (charts, graphs, tables) from your Minitab output as needed to support your narrative (your full statistical results should be documented in the Minitab Project file).

• For each test performed (hypothesis test, ANOVA model), the analysis must include verifying relevant assumptions, conducting post hoc analysis, and evaluating statistical power of the test when relevant.

• If a valid model cannot be created, then discuss the results under the condition that the model is known to be invalid and identify next steps for the analysis.

***Submit a Minitab Project File*** that includes all visualizations and analysis performed. Note that the file must be well-organized with each tab labeled and referenced in the technical report.