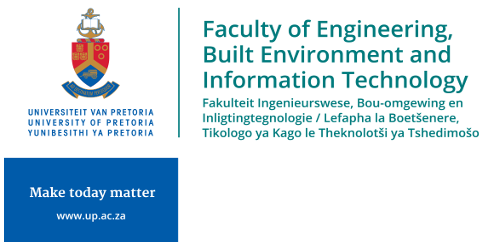
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**DEPARTMENT OF CIVIL ENGINEERING**

**SHC 798**

**APPLIED STATISTICAL METHODS AND OPTIMISATION**

**Multiple Linear Regression & ANOVA**

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*Full names*

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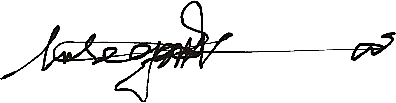
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**2**

*Assignment*

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# Part 1: Multiple Linear Analysis (MLR)

## Question 1

An integrated Infrastructure Asset Management System (IAMS) is very important for both public

### Part a)

### Part b)

Multiple Regression Model [conc\_model]: strength ∼ cement + wcr + age

#### Comment on the Model Output

1. **Regression Coefficients**

The **slope** coefficients (cement: 0.06657, wcr: -37.44811, and age: 0.26614) indicate the respective change (increase [+] or decrease [-]) in the concrete strength when each of the predictors increase by 1 unit, but all other predictors remain unchanged.

* The p-values in summary(conc\_model) determines whether the different response-predictor relationships are statistically significant. The p-value are all below 0.05, so we reject the null hypothesis on a 5% significance level and conclude that all the variables (cement, wcr, and age) significantly affect concrete strength. A zero slope coefficient is implausible for all the predictors.

The **intercept** coefficient corresponds to the estimated (theoretical) concrete strength value when all the predictors (cement, wcr, and age) are equal to zero.

* It’s p-value (0.942) is not statistically significant at the 5% level, and an intercept of zero is plausible.
* However, interpreting this is not practically rational but ensures the regression hyperplane fits the data best within the observed predictor values range. It is not meaningful to extrapolate the predictors to zero.

1. **Model Significance**

From the summary (the global F-Statistic), we gather that p-value is very small (4.441e-14) and that the model is highly significant at the 5% level.

1. **Adequacy of Fit**

The R-squared from summary(conc\_model) indicates how much variation in concrete strength is explained by the three predictors. Here, multiple R2 = 0.6852 (the adjusted R2 = 0.6684), meaning that 68% of the variation in concrete strength is explained by predictors (cement, wcr, and age), while the remaining 32% is due to other factors not included in the model.

a highly adequate fit (high R2), but poor residual plots, verifying that the model is not appropriate

literally may not be meaningful, as real-world conditions rarely involve a speed of exactly zero in this context. its practical importance is limited. how much stopping distance increases per unit increase in speed. A positive slope suggests that higher speeds lead to longer stopping distances.

Part c)

Part d)

Part e)

## Question 2

This report presents a portion of a

### Part a)

## Question 3

Multiple Linear Regression theory questions

### Q 3.1

### Q 3.2

# Part 2: Analysis of Variance (ANOVA)

Analysis of Variance refers to

## Question 4

## Question 5

## Question 6

Analysis Of Variance theory questions

### Q 6.1

### Q 6.2

### Q.6.3

### Q6.4

# REFERENCES