Math 2345 EXAM # 3 Formula Sheet

χ^2 **Test:** eq12.5: The test stat: $\chi^2 = \sum_i \sum_j \frac{(f_{ij}-e_{ij})^2}{e_{ij}}$, where $e_{ij} = \frac{(Row\ i\ Total)(Column\ j\ Total)}{Total\ sample\ size}$

Simple Linear Regression:

eq14.4: Estimated Simple Regression Equation: $\hat{y} = b_0 + b_1 x$

eq14.6: The Slope $b_1 = \dfrac{\sum(x_i - \overline{x})(y_i - \overline{y})}{\sum(x_i - \overline{x})^2}$

eq14.7: The Y-intercept: $b_0 = \overline{y} - b_1\overline{x}$

eq14.8: Sum of squares Due to Error: $SSE = \sum(y_i - \hat{y}_i)^2$

eq14.9: Total sum of squares: $SST = \sum(y_i - \bar{y})^2$

eq14.10: Sum of Squares Due to Regression: $SSR = \sum(\hat{y}_i - \bar{y})^2$

eq14.11: Relationship Among SST,SSR,and SSE: $SST = SSR + SSE$

eq14.12: Coefficient of determination: $r^2 = \frac{SSR}{SST}$

eq 14.15: Mean Square Error: $s^2 = MSE = \frac{SSE}{n-2}$

eq14.16: Standard error of the estimate: $s = \sqrt{\frac{SSE}{n-2}}$

eq14.18: Estimated Standard Deviation of b_1: $s_{b1} = \dfrac{s}{\sqrt{\sum(x_i - \overline{x})^2}}$

eq14.19: t Test Statistic $t_{cal} = \dfrac{b_1}{S_{b_1}}$ with $(n-2)$ degrees of freedom

eq14.20: Mean Square Regression: $MSR = \dfrac{SSR}{\#indvar}$ eq14.21: F Test Statistic: $F = \frac{MSR}{MSE}$

eq14.24: $100(1-\alpha)\%$ CI for $E(y^*)$: $\hat{y}^* \pm t_{\alpha/2}\ s_{\hat{y}^*}$ where (eq14.23:) $s_{\hat{y}^*} = s\sqrt{\dfrac{1}{n} + \dfrac{(x^* - \bar{x})^2}{\sum(x_i - \bar{x})^2}}$

Note: $100(1-\alpha)\%$ CI for B_1: $b_1 \pm t_{\alpha/2}\ s_{b_1}$

Multiple Linear Regression:

eq15.3: Estimated multiple regression equation: $\hat{y} = b_0 + b_1 X_1 + b_2 X_2 + ... + b_p X_p$

eq15.8: Multiple Coefficient of Determination: $R^2 = \dfrac{SSR}{SST}$

eq15.9: Adjusted Multiple Coefficient of Determination: $R_a^2 = 1 - (1 - R^2)\dfrac{n-1}{n-p-1}$

eq15.15: t test Statistic: $t_{cal} = \dfrac{b_i}{s_{b_i}}$ with (n-p-1) degrees of freedom.

Note: $100(1-\alpha)\%$ CI for B_i: $b_i \pm t_{\alpha/2}\ s_{b_i}$

Control Charts: Xbar :and R Chart

eq19.1: Standard Error of the Mean: $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$

$\bar{x}$ Chart for standard deviation known:

eq19.2: $UCL = \mu + 3\sigma_{\bar{x}}$

eq 19.3: $LCL = \mu - 3\sigma_{\bar{x}}$

eq19.4: Overall Sample Mean: $\overline{\overline{x}} = \dfrac{\bar{x}_1 + \bar{x}_2 + \cdots + \bar{x}_k}{k}$

eq19.5: Average Range: $\overline{R} = \dfrac{R_1 + R_2 + \cdots + R_k}{k}$

eq19.8: Control limits For an $\bar{x}$ Chart for standard deviation unknown: $\overline{\overline{x}} \pm A_2\bar{R}$

Control limits for an R chart:

eq19.14: $UCL = \overline{R}D_4$ eq19.15: $LCL = \overline{R}D_3$

Control Chart: p Chart

eq19.16: Standard Error of the Proportion: $\sigma_{\bar{p}} = \sqrt{\dfrac{p(1-p)}{n}}$

Control Limits for a p Chart:

eq19.17: $UCL = p + 3\sigma_{\bar{p}}$

eq19.18: $LCL = p - 3\sigma_{\bar{p}}$