ESMA 6787: Exam 2

Due on December 14, 2025

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Problem 1: Definitions

(a) **Interaction plot:**
(b) **Random effect:**
(c) **Factorial design:**
(d) **Intraclass correlation:**
(e) **Split-plot design:**

Problem 2: Marketing Problem

A marketing research consultant evaluated the effects of fee schedule, scope of work, and type of supervisory control on the quality of work performed under contract by independent marketing research agencies. The quality of work performed was measured by an index taking into account several characteristics of quality. Four agencies were chosen for each factor level combination and the quality of their work evaluated. See **marketing.txt** files for this dataset.

(a) Create interaction plots of the factors for the fee schedule and scope of the work of the estimated treatment means $\bar{Y}_{ij}$. Does it appear that any interactions are present? Any main effects?
(b) Create interaction plots of the factors fee schedule and type of supervisory control of the estimated treatment means $\bar{Y}_{ijk}$. Do your plots convey the same information as those in part (a)?
(c) Obtain the analysis of variance table.
(d) Test for three-factor interactions: using $\alpha = 0.01$. State the alternatives, division rule, and conclusion. What is the p-value of the test?
(e) Test for two-factor interactions (there are three test). For each test, use $\alpha = 0.01$ and state the alternative, decision rule, and conclusions. What is the p-value of each test?
(f) Test for factor fee schedule main effects; use $\alpha = 0.05$. State the alternatives, decision rule, and conclusion. Hint: You can use the confidence interval.

Problem 3: Calculator

To test the efficiency of its new programmable calculator, a computer company selected at random six engineers who ewere proficient in the use of both this calculator and an earlier model and asked them to work out two problems on tboth calculators. One of the problems was statistical in nature, the other was an

(a)