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Section 1

MANE 6313

Subsection 1

Week 6, Module D

Student Learning Outcome

- Select an appropriate experimental design with one or more factors,
- Select an appropriate model with one or more factors,
- Evaluate statistical analyses of experimental designs,
- Assess the model adequacy of any experimental design, and
- Interpret model results.

Module Learning Outcome

Assessing multiple comparisons

Multiple Comparison

- When the analysis indicates that either of the main effects is significant, we can employ multiple comparisons techniques
- Only appropriate for fixed model
- Care must be taken when dealing with interactions. Most often we fix one main effect and compare at the other levels.
- The handwritten work on the next slide is for Problem 5-9 (not 5-2 in 9th edition)

Problem 5-2, Tukey's Example

The four depths averages at a feedrate of 0.30 ae

$\bar{y}_{23\cdot} = \frac{298}{3} = 99.33$ (0.18 in depth)

$\bar{y}_{13\cdot} = \frac{299}{3} = 99.67$ (0.15 in depth)

$\bar{y}_{33\cdot} = \frac{317}{3} = 105.67$ (0.2 in depth)

$\bar{y}_{43\cdot} = \frac{331}{3} = 110.33$ (0.25 in depth)

4 treatments

24 df error

$T_{.05} = q_{.05}(4, 24)\sqrt{\frac{MSE}{2}}$

$= 3.90\sqrt{\frac{28.72}{3}} = 12.07$

Pairwise

0.18 in/min vs. 0.15 in/min: $99.67 - 99.33 = .\overline{33} < T_{.05}$

.15 in/min vs. 0.2 in/min: $105.67 - 99.67 = 6.0 < T_{.05}$

.2 in/min vs .25 in/min: $110.33 - 105.67 = 4.\overline{33} < T_{.05}$

Conclusion: no difference

Which setting to minimize surface finish?

Which setting to maximize surface finish?

Problem 5-9

5.9 An engineer suspects that the surface finish of a metal part is influenced by the feed rate and the depth of cut. He selects three feed rates and four depths of cut. He then conducts a factorial experiment and obtains the following data:

Feed Rate (in/min)	Depth of Cut (in) 0.15	0.18	0.20	0.25
0.20	74	79	82	99
	64	68	88	104
	60	73	92	96
0.25	92	98	99	104
	86	104	108	110
	88	88	95	99
0.30	99	104	108	114
	98	99	110	111
	102	95	99	107

(a) Analyze the data and draw conclusions. Use $\alpha = 0.05$.

(b) Prepare appropriate residual plots and comment on the model's adequacy.

(c) Obtain point estimates of the mean surface finish at each feed rate.

(d) Find the P-values for the tests in part (a).