TIM 7100

DATA FILE 8

ASSIGNMENT 9

1. What are the treatments for a designed experiment with two factors, one qualitative with two levels (A and B) and one quantitative with five levels (50, 60, 70, 80, and 90)?
2. A quality control supervisor measures the quality of a steel ingot on a scale of 0 to 10. He designs an experiment in which three different temperatures ranging from 1,100 to 1,200 degrees Fahrenheit) and five different pressures (ranging from 500 to 600 psi) are utilized, with 20 ingots produced at each Temperature – Pressure combination. Identify the following elements of the experiment:
	1. Response
	2. Factor(s) and factor type(s)
	3. Treatment
	4. Experimental units
3. A partially completed ANOVA table for a completely randomized design is shown here:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Source** | **df** | **SS** | **MS** | **F** |
| Treatments | 6 | 17.5 | 2.9167 | 3.52 |
| Error | 35 | 29.0 | .8286 |  |
| Total | 41 | 46.5 |  |  |

* 1. Complete the ANOVA table.
	2. How many treatments are involved in the experiment?
	3. Do the data provide sufficient evidence to indicate a difference among the population means? Test using α = .10.
	4. Find the approximate observed significance level for the test in part **c**, and interpret it.
	5. Suppose that $\overbar{x}\_{1}=3.7 and \overbar{x}\_{2}=4.1. $Do the data provide sufficient evidence to indicate a difference between µ1 and µ2? Assume that there are six observations for each treatment. Test using α = .10
	6. Refer to part b.Find a 90%confidence interval for (µ1 – µ2).
	7. Refer to part b.Find a 90%confidence interval for µ1.
1. The data in the table below resulted from an experiment that utilized a completely randomized design.

|  |  |  |
| --- | --- | --- |
| **Treatment 1** | **Treatment 2** | **Treatment 3** |
| 3.8 | 5.4 | 1.3 |
| 1.2 | 2.0 | 0.7 |
| 4.1 | 4.8 | 2.2 |
| 5.5 | 3.8 |  |
| 2.3 |  |  |

* 1. Use SPSS to generate an ANOVA analysis and attach a copy of the output:
	2. Test the null hypothesis that µ1 = µ2 = µ3, where µ*i* represents the true mean for treatment I, against the alternative that at least two of the means differ. Useα = .01.
1. An accounting firm that specializes in auditing the financial records of large corporations is interested in evaluating the appropriateness of the fees it charges for its services. As part of its evaluation, it wants to compare the costs it incurs in auditing corporations of different sizes. The accounting firm decided to measure the size of its client corporations in terms of their annual sales. Its population of client corporations was divided into three subpopulations, with

A: Those with sales over $250 million

B: Those with sales between $100 million and $250 million

C: Those with sales under $100 million

The firm chose random samples of 10 corporations from each of the subpopulations and determined the costs (in thousands of dollars) as shown in the table below;

|  |  |  |
| --- | --- | --- |
| **A** | **B** | **C** |
| 250 | 100 | 80 |
| 150 | 150 | 125 |
| 275 | 75 | 20 |
| 100 | 200 | 186 |
| 475 | 55 | 52 |
| 600 | 80 | 92 |
| 150 | 110 | 88 |
| 800 | 160 | 141 |
| 325 | 132 | 76 |
| 230 | 233 | 200 |

* 1. Construct an ANOVA analysis. Conduct a test to determine whether the three classes of firms have different mean costs incurred in audits. Use α = .05.
	2. What is the observed significance level for the test in part b? Interpret it.
	3. What assumptions must be met in order to ensure the validity of the inferences you made in parts b and c?
1. Consider a completely randomized design with *p* treatments. Assume all pairwise comparisons of treatment means are to be made using a multiple comparisons procedure. Determine the total number of treatment means to be compared for the following values of *p.*
	1. *p* = 3
	2. *p* = 5
	3. *p* = 4
	4. *p* = 10
2. Suppose you conduct a 4 x 3 factorial experiment.
	1. How many factors are used in the experiment?
	2. Can you determine the factor type(s) – qualitative or quantitative from the information given? Explain.
	3. Can you determine the number of levels used for each factor? Explain.
	4. Describe a treatment for this experiment, and determine the number of treatments used.
	5. What problem is caused by using a single replicate of this experiment? How is the problem solved?
3. It has been hypothesized that treatment after casting, of a plastic used in optic lenses will improve wear. Four treatments (A – D) are to be tested. To determine whether any differences in mean wear exist among treatments, 28 castings from a single formulation of the plastic were made, and seven castings were randomly assigned to each of the treatments. Wear was determined by measuring the increase in “haze” after 200 cycles of abrasion (better wear indicated by smaller increases). The results are given in the table.

|  |  |  |  |
| --- | --- | --- | --- |
| **A** | **B** | **C** | **D** |
| 9.16 | 11.95 | 11.47 | 11.35 |
| 13.29 | 15.15 | 9.54 | 8.73 |
| 12.07 | 14.75 | 11.26 | 10.00 |
| 11.97 | 14.79 | 13.66 | 9.75 |
| 13.31 | 15.48 | 11.18 | 11.71 |
| 12.32 | 13.47 | 15.03 | 12.45 |
| 11.78 | 13.06 | 14.86 | 12.38 |

* 1. What type of experiment was utilized? Identify the response, factor(s), factor type(s), treatments, and experimental units.
	2. Use SPSS to analyze the data. Is there evidence of a difference in mean among the treatments? Use α = .05.
	3. What is the observed significance level of the test? Interpret it.
	4. Use the Tukey technique to compare all the pairs of treatment means with an overall significance level of α = .10.
	5. Use a 90% confidence interval to estimate the mean wear for lenses receiving Treatment A.