HOMEWORK 7

(Due date: Sunday, 03/17/2024, at 11:00 pm)
Show ALL WORK to get full credit.
(Write the pledge on top of your work and sign under it.)

Note: In your submission, you must do the following:

- You can use a statistical software to get two-way ANOVA table. Besides the ANOVA table, perform calculations manually and SHOW ALL STEPS of your calculations to receive full credit.
- Write down your answer in your own words by yourself.
- Round all test statistics to four decimal places.

Problem 1:

The results of a comparison of four popular minivans are reported in the following table. One of the features the researchers compared was the distance (in feet) required for the minivan to come to a complete stop when traveling at a speed of 60 miles per hour (braking distance). Suppose the braking distances were measured for five minivans of each type with the following results.

Braking Distances (Feet)			
Minivan A	Minivan B	Minivan C	Minivan D
150	153	155	167
152	150	150	164
151	156	157	169
149	151	158	162
153	155	155	173

a) The researcher wished to perform an F-test to compare the average braking distances for the four minivan models. What assumptions must the researcher make to apply this test? Do the data appear to satisfy these assumptions? Explain.

b) Using the F-test, can the researcher conclude at $\alpha = 0.10$ that there is a difference among average braking distances for the four minivan models?

Problem 2:

Solve Problem 1 using the Tukey's method. Compare the results to the results obtained by using the F-test.

Problem 3:

Solve Problem 1 using the Bonferroni method. Compare the results to the results obtained by using the Tukey's method.

Problem 4:

An Internet service provider is considering four different servers for purchase. Potentially, the company would be purchasing hundreds of these servers, so it wants to make sure it is making the best decision. Initially, five of each type of server are borrowed, and each is randomly assigned to one of the 20 technicians (all technicians are similar in skill). Each server is then put through a series of tasks and rated using a standardized test. The higher the score on the test, the better the performance of the server. The data are as follows.

Server Test Scores			
Server 1	Server 2	Server 3	Server 4
48.5	56.4	52.1	64.3
46.5	68.2	56.3	68.3
52.4	68.5	48.3	72.2
54.1	64.2	52.2	70.6
58.9	60.1	54.8	56.5

Perform a Kruskal-Wallis test on these data using $\alpha = 0.10$. Are there differences between the servers?

Problem 5:

The following table gives the survival times (in hours) for animals in an experiment whose design consisted of three poisons, four treatments, and four observations per cell.

Poison	Treatment							
	A		B		C		D	
I	3.1	4.5	8.2	11.0	4.3	4.5	4.5	7.1
	4.6	4.3	8.8	7.2	6.3	7.6	6.6	6.2
II	3.6	2.9	9.2	6.1	4.4	3.5	5.6	10.0
	4.0	2.3	4.9	12.4	3.1	4.0	7.1	3.8
III	2.2	2.1	3.0	3.7	2.3	2.5	3.0	3.6
	1.8	2.3	3.8	2.9	2.4	2.2	3.1	3.3

Conduct a two-way analysis of variance to test the effects of the two main factors and their interaction. Use $\alpha = 0.10$.

Problem 6:

A banana grower has three fertilizers from which to choose. He would like to determine which fertilizer produces banana trees with the largest yield (measured in pounds of

bananas produced). The banana grower has noticed that there is a difference in the average yields of the banana trees depending on which side of the farm they are planted (South Side, North Side, West Side, or East Side). Because of the variation in yields among the areas on the farm, the farmer has decided to randomly select three trees within each area and then randomly assign the fertilizers to the trees. After harvesting the bananas, he calculates the yields of the trees within each of the areas. The results are as follows.

Banana Yields (Pounds)			
	Fertilizer A	Fertilizer B	Fertilizer C
South Side	53	51	58
North Side	48	47	53
West Side	50	48	56
East Side	50	47	54

a) Do you think a randomized block design is appropriate for the banana grower's study? What assumptions must the banana grower make to apply this test? Do the data appear to satisfy these assumptions? Explain.
b) Perform a two-way ANOVA using randomized block design. Use $\alpha = 0.10$.

Problem 7:

Solve Problem 6 using the Friedman's Test. Compare the results to the results obtained in Problem 6.