EXAM I

PSTAT 122 HSU 5/5/2022 3:30 - 4:45 p.m.

Fully explain your answer. Answers with no explaination will not receive credit.

Please submit your answers online (GradeScope) by 5:00 p.m. Late answers will not be accepted.

(60%) 1. A car rental agency is in the process of deciding the brand of tire to purchase as standard equipment for its fleet. As a part of the decision process, they are interested in studying the treadlife of four competing brands (A, B, C and D). Based on testing, the research department determined that each of five tires of each brand lasted the following number of miles (in 1,000s):

Brands	A	B	C	D
	43	45	26	42
	47	47	32	38
	50	49	31	42
	48	51	27	46
	47	48	29	42
Sample mean	47	48	29	42
Sample variance	6.5	5.0	6.5	8.0
Population mean	μ_A	μ_B	μ_C	μ_D

(10%) (a) Complete the following ANOVA table.

SOURCE	SS	DF	MS
Between Brands			
Error			6.50
Total			

(10%) (b) Test at the $\alpha = 0.05$ level that the four tire brands will have the same average miles of wear.

(10%) (c) Write a statistical model for this experiment and state assumptions associated with the elements in the model. Estimate all of the parameters in the model.

(10%) (d) It is of interest to compare brand C with brands A, B, and D. Test $H_0 : \mu_C = \frac{1}{3}(\mu_A + \mu_B + \mu_D)$. Use $\alpha = 0.05$.

(10%) (e) Find a 95% confidence interval for $\mu_A - \mu_B$.

(10%) (f) It is of interest to compare brands A, B and D. At the 5% significance level, can you conclude that the average miles of wear are the same among these three brands?

(40%) 2. Several ovens in a metal working shop are used to heat metal specimens. All ovens are supposed to operate at the same temperature, although it is suspected that this may not be true. Three ovens are selected at random and their temperatures on successive heats are noted. The data collected are as follows.

Ovens	Temperature				sample mean	sample variance
1	491.5	498.3	498.1	494.1	495.5	10.85
2	488.4	484.6	479.7	477.3	482.5	24.7
3	483.0	486.9	491.6	487.3	487.2	12.37

(20%) (a) Is there a significant variation in temperature between ovens in the shop? Use $\alpha = 0.05$.

(10%) (b) Write a statistical model for this experiment and state assumptions associated with the elements in the model. Estimate all parameters in the model.

(10%) (c) Find a 95% confidence interval for the mean temperature for all ovens in the shop.