BIA 654 Homework 5

- Be sure to include statistical software outputs to show your work.

- Submit each homework at the beginning of each class.

1. The plant manager wants to investigate the productivity of three groups of workers: those with little (A), average (B), and considerable work experience (C). Since the productivity depends to some degree on the day-to-day variability of the available raw materials, which affects all groups in a similar fashion, the manager suspects that the comparison should be blocked with respect to day. The results (productivity, in percent) from five production days are given in the following table:

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Day

Experience	1	2	3	4	5
A	53	58	49	52	60
B	55	57	53	57	64
C	60	62	55	64	69

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   (a) Assuming the underlying assumptions of ANOVA are met, are there differences in the mean productivity among the three groups? (Use $\alpha = 0.05$.)

   (b) Has the blocking made a difference? That is, is there a difference in results between one-way ANOVA *without* blocks and one-way ANOVA *with* blocks?

2. Suppose you want to determine whether the brand of laundry detergent used and the temperature affects the amount of dirt removed from your laundry. To this end, you buy two different brand of detergent ("Super" and "Best") and choose three different temperature levels ("cold", "warm", and "hot"). Then you divide your laundry randomly into $6 \times r$ piles of equal size and assign each r piles into the combination of ("Super" and "Best") and "cold", "warm", and "hot").

   We are interested in testing Null Hypotheses

   H_{0D}: The amount of dirt removed does not depend on the type of detergent
   H_{0T}: The amount of dirt removed does not depend on the temperature
   H_{0DT}: There is no interaction effect between the type of detergent and the temperature.

   This experiment has two factors (Factor Detergent, Factor Temperature) at $a = 2$ (Super and Best) and $b = 3$ (cold, warm, and hot) levels. Thus there are $ab = 32 = 6$ different combinations of detergent and temperature. With each combination you wash $r = 4$ loads and r is called the number of replicates. This sums up to $n = abr = 24$ loads in total. The amounts X_{ijk} of dirt removed when washing sub pile k ($k = 1, 2, 3, 4$) with detergent i ($i = 1, 2$) at temperature j ($j = 1, 2, 3$) are recorded in the following Table. Perform appropriate analysis to test the above three hypotheses with $\alpha = 0.05$.

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	Cold	Warm	Hot
Super	4, 5, 7, 5	7, 9, 8 ,12	10, 12, 11, 9
Best	6, 5, 4, 4	13, 15, 12, 12	12, 13, 11, 13

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