Department of Industrial Engineering & Operations Research

IEOR 165 (Spring 2016)

Practice Questions (2nd Half)

Question 1. Suppose on any given day you are either happy, so-so or sad. Assume that the chance of being in these three states tomorrow only depends on the state today. Then your mood transition process can be modeled as a discrete time Markov chain. The following data is available.

	Happy tomorrow	So-so tomorrow	Sad tomorrow
Happy today	120	30	40
So-so today	80	40	50
Sad today	10	60	100

Given the data, estimate the transition probabilities by MLE.

Question 2. The mean response time of a species of pigs to a stimulus is 0.8 seconds. 28 pigs were given 2 oz of alcohol and then tested. If their average response time was 1.0 seconds with a standard deviation of 0.3 seconds, can we conclude that alcohol affects the mean response time? Use the 5 percent level of significance and assume there are two-sided deviations.

Question 3. The viscosity of two different brands of car oil is measured and the following data resulted:

Brand 1	10.62	10.58	10.33	10.72	10.44	10.74	
Brand 2	10.50	10.52	10.58	10.62	10.55	10.51	10.53

Test the hypothesis that the mean viscosity of the two brands is equal, assuming that the populations have normal distributions with equal variances.

Question 4. A set of 10 determinations, by a method devised by the chemist Karl Fischer, of the percentage of water in a methanol solution yielded the following data.

$$0.50,\ 0.55,\ 0.53,\ 0.56,\ 0.54$$

$$0.57,\ 0.52,\ 0.60,\ 0.55,\ 0.58$$

Assuming normality, use these data to give a 95 percent confidence interval for the actual percentage.

Question 5. The following data present the number of defective products in subgroups of size 100. Under normal conditions, the fraction defective is 0.01.

Subgroup	Number of defective products
1	2
2	1
3	4
4	3
5	2
6	5

Derive the LCL and UCL to control the fraction defective of this process and determine whether the process is in control or not at the significance level of 0.05.