

## Review after Midterm 2

**Final exam: December 12, 8:00-10:00am. Extra office hour: Tuesday, December 11, 10:00-11:30am, 2:00:00-4:30pm, PHSC 1006.**

### **Estimation using confidence intervals (Chapter 7, section 7.3-7.4, 7.11)**

Point estimators: kth moment estimators, maximum likelihood estimators.

**Exercise 1.** Let  $y_1, \dots, y_n$  be a random sample of  $n$  observations on a random variable  $Y$ , where  $f(y)$  is an exponential distribution with mean  $\beta$ .

- (a). Find the moment estimator of  $\beta$ .
- (b). Find the maximum likelihood estimator of  $\beta$ .
- (C). Are they biased?

Interval estimators and choosing the sample size for large sample: Confidence of interval, large Sample  $(1 - \alpha)100\%$  confidence interval for mean, small Sample  $(1 - \alpha)100\%$  confidence interval for mean. Estimate the sample size for test.

**Exercise 2.** Suppose we want to sample a stable process that deposits a 500 Angstrom film on a semiconductor wafer in order to determine the process mean so that we can set up a control chart on the process. The initial guess regarding the variation in the process is that the standard deviation is about 60 Angstroms. We want to estimate the mean within 10 Angstroms ( $= 10$ ) of the true mean with 95% confidence ( $\alpha = .05$ ,  $Z_{\alpha/2} = 2$ ). Determine the sample size.

### **Tests of Hypotheses (Chapter 8, section 8.1-8.6)**

Hypotheses, test statistic, decision, type of errors and probabilities:

**Exercise 3.** A manufacturer of fishing line wants to show that the mean breaking strength of its 22-pound line is really bigger than 22 pounds. (a). They choose 50 sample and test the strength. It turns out the mean strength is 23 pound and the standard deviation is 4. Using  $\alpha = 0.01$  ( $Z_{0.01} = 2.33$ ), can the test convince you that the strength is bigger than 22 pounds? (b). If he want to show that the mean breaking strength of a competitor's 22-pound line is really less than 22 pounds. Design a test and hypotheses for the test.

The observed significant level: p-value:

**Exercise 4.** Given the data from Exercise 3, what is the p-value for the observation?

**WARNING: YOU ARE RESPONSIBLE FOR CHECKING OUT MY TYPOS!**

Comments and question to: [mzhu@math.ou.edu](mailto:mzhu@math.ou.edu)

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