6th

Problems for the Session on ~~2nd~~ November 2020

1. Determine the maximum likelihood estimator of θ when $X_1, X_2, \ldots X_n$ is a sample with density function:

$$f(x) = \frac{1}{2} exp\{-|x-\theta|\}, \quad -\infty < x < \infty$$

2. Let $X_1, X_2, \ldots X_n, X_{n+1}$ be a sample from a normal population with unknown mean μ and standard deviation 1. Let $\bar{X}_n = \frac{1}{n}\sum_{i=1}^{n} X_i$ be the average of the first n of them.

   a. What is the distribution of $X_{n+1} - \bar{X}_n$?

   b. If $\bar{X}_n = 4$, give an interval that, with 90% confidence, will contain the value X_{n+1}

3. A sample of 20 cigarettes is tested to determine nicotine content and the average value observed was 1.2mg. Compute 99% two-sided confidence interval for the mean nicotine content of a cigarette if it is known that the standard deviation of a cigarette's nicotine content is 0.2mg.

4. A sample of 20 cigarettes is tested to determine nicotine content and the average value observed was 1.2mg and sample variance is observed as 0.04mg. Find a value of c for which we can assert with 99% confidence that c is larger than the mean nicotine content of the cigarette.

5. The capacities (in Ampere-hour) of ten batteries were recorded as follows: 140, 136, ,150, 144, 148, 152, 138, 141, 143, 151

   a. Estimate the population variance σ^2

   b. Compute a 99% two-sided confidence interval for σ^2

   c. Compute a value v that enables us to state, with 90% confidence that σ^2 is less than v

6. A random sample of 1200 engineers included 48 Hispanics Americans, 80 African Americans and 204 females. Determine 90% confidence intervals for the proportion of all engineers who are

   a. Female

   b. Hispanic Americans or African Americans