SOLUTIONS

King Fahd University of Petroleum & Minerals

Department of Mathematics & Statistics - STAT-319-Term071-Quiz6

Name: ID: Sec.: Serial:

Q1. The brightness of a television picture tube can be evaluated by measuring the amount of current required to achieve a particular brightness level. A sample of 10 tubes results in $\overline{X} = 317.2$ and $S = 15.7$. Find (in microamps) a **99%** confidence interval on mean current required. State any ***necessary assumptions*** to obtain the confidence interval

$1-\alpha = 0.99 \Rightarrow \alpha = 0.01 \therefore t_{\alpha/2, n-1} = t_{0.005,9} = 3.250$

$$\overline{X} \pm t_{\alpha/2, n-1} \cdot \frac{S}{\sqrt{n}} = 317.2 \pm (3.250)\frac{(15.7)}{\sqrt{10}}$$

A 99% C.I for μ is: $\Rightarrow 317.2 \pm 16.1355$ **(4-Points)**

$301.0645 < \mu < 333.3355$

Assumptions are:

1. population is normally distributed
2. σ is unknown **(2-Points)**
3. n is small (n < 30

Q2. The makers of a new chemical fertilizer claim that hay yields will average 0.4 tons more per acre if its fertilizer is used than if the leading brand is used. The agricultural testing service was retained to test this claim. A random sample of 52 acre-sized pots was selected, and the new fertilizer was applied. A second sample of 40 acre-sized plots was selected, but leading fertilizer was used. The following sample data (in tons per cares) were observed.

Current Leading brand	New Product
$n_1 = 40$	$n_2 = 52$
$\overline{X}_1 = 4.3 tons/acre$	$\overline{X}_2 = 5.2 tons/acre$
$S_1 = 0.8 tons$	$S_2 = 0.7 tons$

Obtain a ***95%*** confidence interval for the ***difference*** between the two population means.

$1-\alpha = 0.95 \Rightarrow \alpha = 0.05 \therefore Z_{\alpha/2} = Z_{0.025} = 1.96$

A 99% C.I for $\mu_1 - \mu_2$ is:

$$(\overline{X}_1 - \overline{X}_2) \pm Z_{\alpha/2}\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}$$

$$\Rightarrow (4.3 - 5.2) \pm (1.96)\sqrt{\frac{(0.8)^2}{40} + \frac{(0.7)^2}{52}}$$ **(4-Points)**

-0.9 ± 0.3125

$-1.2125 < \mu_1 - \mu_2 < -0.5875$