ENGR 115
Test No. 3
(SHOW YOUR WORK)

Key

1- Assume that the mean hourly cost to operate a commercial airplane follows a normal distribution with a mean of $2100 per hour and a standard deviation of $250. Determine the highest 4% of the operating cost. (20 pts)

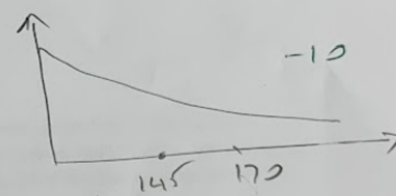
$$1.75 = \frac{X_{min} - 2100}{250}$$

-10

$z = 1.75$
.96

$$X_{min} = 2537.5 \ \$/HR$$

2- Rainfall duration at a location along the Gulf Coast follows an exponential distribution with a mean value of 2.725 hours. What is the probability that a duration of a particular rainfall event is between 145 to 170 minutes? (20 pts)



-10

$$E(x) = 2.725 \ \frac{HR}{Rain}$$

$$\lambda = \frac{1}{2.725} \ \frac{Rain}{HR}$$

$$P(x < 170) - P(x < 145)$$

$$= 1 - e^{-\frac{1}{2.725}\left(\frac{170}{60}\right)} - \left[1 - e^{-\frac{1}{2.725}\left(\frac{145}{60}\right)}\right]$$

$$= .6465 - .5880 = .0585$$

3- What is the confidence level for the interval $\bar{x} \pm 1.85\frac{\sigma}{\sqrt{n}}$? (10 pts)

-5

$$\frac{\alpha}{2} = .0322$$

$$\alpha = (.0322)(2) = .0644$$

$$CI = 1 - .0644$$
$$= .9356$$

4- The article "Ultimate Local Capacities of Expansion Anchor Bolts" (J. of Energy Engr., 1993: 139-158) gave the following summary data on shear strength (kip) for a sample of 3/8-in anchor bolts: n= 18, mean is 4.50, and a sample standard deviation of 1.5. Calculate a 95% confidence interval for true average shear strength. Interpret your finding. (15 pts)

$df = 18-1 = 17 \rightarrow t_{.025} = 2.11$

I am confid....

$\bar{x} = 4.5$

$s = 1.5$

$$\bar{x} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$$

$$4.5 \pm 2.11 \left(\frac{1.5}{\sqrt{18}}\right) = 4.5 \pm .50$$

5-Seventhy seven percent of 100 randomly selected students from college of science and engineering were happy with their college experience. Construct a 92% confidence interval for the true proportion of "happy" students and interpret your finding. (15 pts)

$$\hat{p} \pm z_{\alpha/2} \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

$$.77 \pm 1.75 \sqrt{\frac{.77(1-.77)}{100}}$$

-7

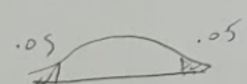
$$.77 \pm .07$$

6- A state legislator wishes to survey residents of her district to see what proportion of the registered voters are aware of her position on using state funds to pay for a new Entertainment Center. What sample size is necessary if the 90% CI for population proportion to be within 7% of the true proportion? (10 pts)

Assum. $p = .5$

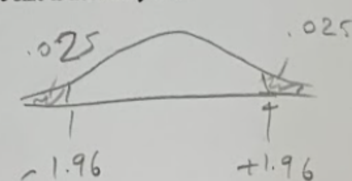
$$n = .5(1-.5)\left(\frac{1.645}{.07}\right)^2 = 138.06$$

Say 139 samples



7-Assume that helium porosity (in percentage) of coal samples taken from any particular seams is normally distributed with a true standard deviation of 0.75. How large a sample size is necessary if the width of the 95% interval is to be 0.48? (10 pts)

$$ME = \frac{\text{Width}}{2} = \frac{.48}{2} = .24$$



$$n = \left(\frac{1.96 \times .75}{.24}\right)^2 = 37.5$$

Say 38 sample.