**ChE 320\_Spr\_17\_HW 5 Rubric**

**Total: 100 pts.**(Please do not cut point more than once for the same mistake, e.g. If there are 3 parts in a question, answer was calculated wrong in the 1st part. But the method was correct for the 2nd and 3rd part; give student the points of 2nd and 3rd part*. If applicable, credits for the answers are also given for using correct units*)

**4-2** (page 155) **(20 pts)**

 *+7 for correct method, +3 for answer*

Mean = Sum/N = 399.851/16 = 24.99 *+7 for correct method, +3 for answer*

Variable N Mean SE Mean StDev Sum

X 16 24.99 0.159 0.636 399.851

**4-5 (20 pts)**

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and  are unbiased estimators of μ. *+5 for correct equations, +2 for correct conclusion*

The variances are V and V; compare the MSE (variance in this case),

 *+5 for correct equations, +2 for correct conclusion*

Because both estimators are unbiased, examination of the variances would conclude that  is the “better” estimator with the smaller variance. *+6 for correct conclusion*

**4-14 (20 pts)**

Show that is a biased estimator of μ.

Using (We used this formulae in class and also see the derivation in the handwritten notes of 1\_30 in blackboard)



Therefore, is a biased estimator of μ. *+6 for correct methods, +2 for correct conclusion*

b) Bias =  *+4 for correct equations, +2 for correct conclusion*

c) Bias decreases as *n* increases. *+6 for correct conclusion*

**4-16 (20 pts)**

a) == P(Z ≤ −4) = 0.

The P-value is approximately 0 when a sample size of 16. *+6 for correct method, +2 for answer*

b) For α = 0.05, fail to reject H0 if 



The probability of failing to reject the null hypothesis if the true mean elongation force is 13.5 kg is approximately 0, with a level of significance of α = 0.05. *+6 for correct method, +2 for answer*

c) 1 - β = 1 – 0= 1  *+4 for answer*

**4-20 (20 pts)**

Use n = 5, everything else held constant:

a) P(≤ 98.5) + P( ≥101.5)

=+

= P(Z ≤ −1.68) + P(Z ≥ 1.68)

= 0.093  *+6 for correct method, +2 for answer*

b) β = P(98.5 ≤≤ 101.5 when μ = 103)

=

= P(−5.03 ≤ Z ≤ −1.68)

= P(Z ≤ −1.68) − P(Z ≤ −5.03)

= 0.04648 − 0

= 0.04648  *+4 for correct method, +2 for answer*

c) β = P(98.5 ≤≤ 101.5 when μ = 105)

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= P(−7.27≤ Z ≤ −3.91)

= P(Z ≤ −3.91) − P(Z ≤ −7.27)

= 0.00005 − 0

= 0.00005  *+4 for correct method, +2 for answer*