Pg(1)

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Subject : Statistical Inference

•) Question :-1

$n=25$, $s=237.52$

$S^2=(237.52)^2=56415.7504$

•) For 95% C.I :-

$1-0.95=0.05$

$\alpha=0.05$

$\alpha/2=0.025$

$1-0.025=0.975$

$n-1$

$25-1=24$

•) Critical values :-

$\alpha/2=0.025=39.364$

$1-\alpha/2=0.975=12.401$

$$\frac{(n-1)S^2}{\chi^2_{\alpha/2}} \leq \sigma^2 \leq \frac{(n-1)S^2}{\chi^2_{1-\alpha/2}}$$

$$= \frac{24\times 56415.7504}{39.364} \leq \sigma^2 \leq \frac{24\times 56415.7504}{12.401}$$

$$= \frac{1353978.01}{39.364} \leq \sigma^2 \leq \frac{1353978.01}{12.401}$$

$$= 34396.35225 \leq \sigma^2 \leq 109182.9699$$

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•) For 50% C.I:-

$\alpha = 0.5$

$\alpha/2 = 0.25$

$1 - \alpha/2 = 0.75$

•) Critical values:-

$0.25 = 28.241$

$0.75 = 19.037$

$$= \frac{(n-1)S^2}{\chi^2 \alpha/2} \leq \sigma^2 \leq \frac{(n-1)S^2}{\chi^2 \alpha/2}$$

$$= \frac{1353978.01}{28.241} \leq \sigma^2 \leq \frac{1353978.01}{19.037}$$

$$= 47943.69923 \leq \sigma^2 \; 71123.49681$$

(Q2) $n_1 = 5$, $S_1 = 3.4$

$n_2 = 6$, $S_2 = 2.6$

$S_1^2 = 3.4^2 = 11.56$ $\quad V_1 = n_1 - 1 = 5 - 1 = 4$

$S_2^2 = 6.76$ $\quad V_2 = n_2 - 1 = 6 - 1 = 5$

•) For 99% C.I:-

$\alpha = 0.01$

$\alpha/2 = 0.005$

$V_1, V_2 = 15.56$

$V_2, V_1 = 22.46$

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$$= \frac{S_1^2}{S_2^2} \times \frac{1}{f_{\alpha/2}(v_1,v_2)} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{S_1^2}{S_2^2} \times f_{\alpha/2}(v_2,v_1)$$

$$= \frac{11.56}{6.76} \times \frac{1}{15.56} < \frac{\sigma_1^2}{\sigma_2^2} < \frac{11.56}{6.76} \times 22.46$$

$$= 0.1099 < \frac{\sigma_1^2}{\sigma_2^2} < 38.4079$$

•) For 90% C.I:-

$\alpha = 0.10$ $\quad v_1, v_2 = 7.39$

$\alpha/2 = 0.05$ $\quad v_2, v_1 = 9.36$

$$= \frac{11.56}{6.76} \times \frac{1}{7.39} < \frac{\sigma_1^2}{\sigma_1^2} < \frac{11.56}{6.76} \times 9.36$$

$$= 0.231 < \frac{\sigma_1^2}{\sigma_1^2} < 16.0061$$

Question :- 3

$\mu = 60$, $\sigma = 12$, $n = 225$, $\bar{X} = 65$

$\alpha = 2\% = 0.02$

Step :-1

$H_0 : \mu = 60$

$H_1 : \mu \neq 60$

Step: 2

$\alpha = 0.02$

$\alpha/2 = 0.01$

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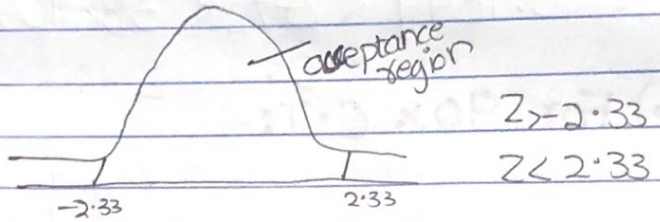
$1-0.01=0.99$ from table $Z=2.33$

Step 3:-

$$Z\text{-test}$$

$$Z=\frac{\bar{X}-\mu}{\sigma/\sqrt{n}}$$

Step 4:-



Step 5:-

$$Z=\frac{65-60}{12/\sqrt{25}}=\frac{5}{0.8}=6.25$$

Value 6.25 is greater than 2.33 so its present in rejection region, so we reject H_0 and accept H_1, i-e $\mu \neq 60$.

•) P-Value:-

$Z=6.00$ (6.25 is not available in table)

$P(Z>6.00)=0.9999$

$P(Z\leq 6.00)$ – ignored because not in table

$=1-0.9999=0.0001$

P value $<\alpha$

$0.00001<0.02$

So we reject H_0 and accept H_1.

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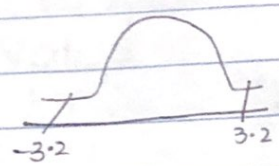
Q4

Z = -1.5
We will accept null hypothesis because value is present in acceptance region.



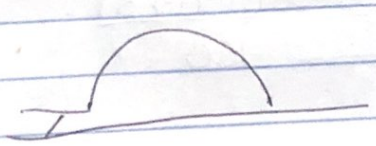
Z = 2.9
As value is present in acceptance region so we will accept the null hypothesis.

Q5) $\mu = 1$, $n = 20$, $S = 0.02$

•) H_0 ; $\mu = 1$
H_1 ; $\mu < 1$

•) t-test will be used because σ is unknown and sample standard deviation is known.

•) Nature of test is one tail because H_1 value or alternate hypothesis is on negative side of the distribution, it is left tail



Zvalue.

X — X — X — X

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Q6) $\pi = 88\% = 0.88$, $n = 100$, $P = \frac{93}{100} = 0.93$

$\alpha = 0.01$

Step(1) $H_0 : \pi = 0.88$

$H_1 : \pi > 0.88$

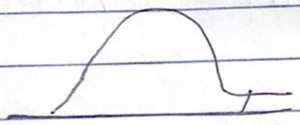
Step(2)

$\alpha = 0.01$ $\quad 1 - 0.01 = 0.99 - Z = 2.33$

Step(3)

Z-test $\quad Z = \frac{P - \pi}{\sqrt{\frac{\pi(1-\pi)}{n}}}$

Step(4)



$Z > 2.33$

Step(5)

$$Z = \frac{0.93 - 0.88}{\sqrt{\frac{0.88(1-0.88)}{100}}}$$

$$Z = \frac{0.05}{\sqrt{\frac{0.88 \times 0.12}{100}}} = \frac{0.05}{\sqrt{0.001056}} = 1.5386$$

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Value 1·538 is less than 2·33 its in acceptance region So we accept Ho and reject H1 i·e $\pi > 0.88$.

•) **P-Value :-**

$P(z > 1.5386)$

round off $P(z > 1.54) = 0.9382$

$1 - 0.9382 = 0.0618$

$P\text{value} > \alpha$

So we accept Ho and reject H1.

X—X —X —X —Y