Q1.

(i) Since the population variance is unknown. We use T-distribution.

$$T = \frac{\bar{x} - \mu}{\sigma/\sqrt{n}}, \text{ where } \bar{x} = \frac{0.95+1.02+1.01+0.98}{4} = 0.99$$

and $\sigma^2 = \frac{1}{n-1}\sum(X_i - \bar{x})^2 = 0.001$

Hence Pivot RV is $T = \frac{0.99 - \mu_0}{0.0158} \sim t_3$

(ii) For 90% C.I. since $\alpha = 0.1$, $n = 3$ we know from t-table $t_{0.05,3} = 2.35$

Hence the C.I. is $\bar{x} \pm t_{\alpha,n} s/\sqrt{n}$

MoE $[0.99 - 0.03713, 0.99 + 0.03713]$

For 95% C.I. since $\alpha = 0.05$, $n = 3$, $t_{0.025,3} = 3.18$

MoE $[0.99 - 0.05024, 0.99 + 0.05024]$

Q2: (a) Since, the population is normal

For 95% C.I. $s^2=36$, $n=16$, $\alpha=0.025$, $df=15$

we can get the pivot $T=15\times36/\sigma^2 \sim \chi^2_{15}$

$L_1=6.26$ $U_1=27.49$

Hence C.I. is $\left(\frac{15\times36}{27.49}, \frac{15\times36}{6.26}\right) \Rightarrow (19.1, 83.8)$

Similarly For 99% C.I. $s^2=36$. $n=16$. $\alpha=0.005$. $df=15$

we get the pivot $T=15\times36/\sigma^2 \sim \chi^2_{15}$

$L_2=4.6$ $U_2=32.8$

Hence C.I. is $\left(\frac{15\times36}{32.8}, \frac{15\times36}{4.6}\right) \Rightarrow (16.0, 114.1)$