19k-0273 (BCS-5A)

Assignment #3

Q.1) Given:

$z_{\alpha/2} = 99\% = 2.68$, $\bar{x} = 0.2$, $n = 18$, $\sigma = 0.0718795$

$\because \bar{x} \pm z_{\alpha/2} \frac{\sigma}{\sqrt{n}}$

$= 0.2 \pm 2.68 \frac{0.0718795}{\sqrt{18}}$

$\Rightarrow 0.156284 < \mu < 0.243710$ Ans

Q.2) Given:-

(SI) $\sigma_1 = 1.4$, $\bar{x}_1 = 5.3$, $z_{\alpha/2} = 1.96$, $n_1 = 18$

$\bar{x}_2 = 4.8$, $\sigma_2 = 1.6$, $n_2 = 12$

$\therefore t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \Rightarrow t = \frac{5.3 - 4.8}{\sqrt{\frac{1.4^2}{18} + \frac{1.6^2}{12}}} \Rightarrow \boxed{t = 0.8808}$

So, Pvalue test $(0.8808, 28) = 0.1929$

$\Rightarrow$ Pvalue $= 0.4039 > \alpha = 0.05$

Hence, fail to reject H_0. Ans

Q.3) Given:

$t = -2.6804$, $df = 17.832$, p-value $= 0.01536$

∴ alternative hypothesis is true as difference in mean isn't equal to zero. Hence, 95% confidence interval gives:

$\Rightarrow (-131.48826, -15.89269)$

- Sample estimate mean of x & y:

$\Rightarrow (394.8429, 468.333)$

$\Rightarrow$ p-value $= 0.01536 < 0.05$

Hence, we reject null hypothesis. Ans

Q.4) ANOVA:

	df	SS	MS	f	Significance
regression	1	1259.046	1259.246	8.614785	0.02565
residual	6	868.8286	144.804		
total	7	2127.875			

	coefficients	standard error	t-stat	P-Value	lower 95%	up
Intercepts	-31.208	21.97882	-1.44991	0.20544	-84.9882	22
Fires	1.029684	0.3492	2.948672	0.2565	0.175222	1.8

Hence, regression equation is,

$Y = -31.21 + 1.03X$

when, $X = 60$:

$Y = -31.21 + 1.03(60)$

$\Rightarrow \boxed{Y = 30.59}$ Ans

Q.6) Regression Stats:

Multiple R	0.837454876
R Square	0.701133067
Adjusted R Square	0.634915708
Standard Error	14.91998986
Observation	12

ANOVA:

	df	SS	MS	F	Significance
Regression	2	4704.2923	2352.1146	10.56682	0.00434
Residual	9	2003.3743	222.5971		
Total	11	6707.666			

	Coefficients	Standard Error	t-Stat	P-value
Intercept	-33.83823	106.7253	-0.3170	0.75843
X_1	0.314101	0.33988	1.1595	0.27608
X_2	10.804660	4.91928	2.1963	0.053663

Ans

Q.7) Given:

level of significance = 0.05, $\bar{X}_A = 5.44$, $\bar{X}_B = 7.9$, $\bar{X}_C = 4.3$, $\bar{X}_D = 2.98$, $\bar{X}_E = 6.96$, $\bar{X}_{GM} = 5.516$

$$\therefore SSB = \sum n_j (\bar{X}_j - \bar{X})^2$$

$$= (5(5.44 - 5.516))^2 + (5(7.9 - 5.516))^2 + \dots + (5(6.96 - 5.516))^2$$

$$= 78.4216$$

Similarly, for Total: $SST = \sum\sum (x_{ij} - \bar{x})^2 = 137.9536$

Within Groups

$SSW = SST - SSB$

$\Rightarrow SSW = 137.9536 - 78.4216$

$\Rightarrow SSW = 59.532$

Now, no. of degree Freedom:

$df_B = 5 - 1 = 4$

$\therefore MSB = \frac{SSB}{df_B} = \frac{78.4216}{4} = 19.6049$

Within Groups

$df_W = 25 - 5 = 20$

$\therefore MSW = \frac{SSW}{df_W} = \frac{54.532}{20} = 2.9766$

Finally, calculating F-statistics:

$f = \frac{MSB}{MSW} = \frac{19.6049}{2.9766} = 6.5865$

$\Rightarrow$ p-value $\approx$ 0.00014

$\because$ p is less than the level of significance (i.e. 0.05), hence null hypothesis is rejected. Ans