Ali Kdedarr   Midterm Exam 3

Problem 1:

Group	Sample Size	Mean	Std. Dev
Organic	20	5.5835	0.59356
Control	20	5.0825	0.6216
Comfort	22	4.88727	0.57291

Problem 2:

$H_0: \emptyset_1 = \emptyset_2$

$H_A: \emptyset_1 \neq \emptyset_2$

$F = \dfrac{(0.59356)^2}{(0.57291)^2} = 1.0734$

$DF = (20-1, 22-1) = F(19, 21)$

Using Table E the p-value is $0.8698 > 0.05$, therefore we fail to reject the null hypothesis.

Problem 3:

$H_0: \mu_1 = \mu_2$

$H_A: \mu_1 \neq \mu_2$

$D.O.F = \min(19, 21)$

$D.O.F = 19$

$t = \dfrac{(5.5835 - 4.88727)}{\sqrt{\dfrac{(0.59356)^2}{20} + \dfrac{(0.57291)^2}{22}}}$

$= 3.8599$

$P(|T| > 3.8599) = 4.11 \times 10^{-4}$

(ii) The p-value is less than 0.05 so we reject the null hypothesis. Meaning there is a difference in morality between the groups Organic and comfort.

Problem 1:

$H_0 : \mu_1 = \mu_2 = \mu_3$

H_A : They are not all equal

(i) $\bar{x} = \dfrac{[20(5.5835) + 20(5.0925) + (22)(4.88727)]}{20 + 20 + 22}$

$\bar{x} = 5.1748$

Groups	Averages	Variances
Organiz	5.5835	0.3523
Control	5.0825	0.3864
Comfort	4.88727	0.3282

(ii) $SSB = \sum\limits_{i=1}^{3} n_i (\bar{x}_i - \bar{x})^2 = 5.3299$

$SSE = \sum\limits_{i=1}^{3} (n_i - 1) S_i^2 = 20.9275$

$SST = SSB + SSE = 26.2574$

(iii) Table

Source	DOF	SS	MS	F
Group	2	5.3299	2.66495	F=7.51
Error	59	20.9275	0.3547	
Total	61	26.2574		

(iv) P-value : $P(F > 7.51) = 1 - pt(7.51, 2, 59)$

Since the p-value < 0.05 we reject the null hypothesis, and conclude there might be a link

(v) $R^2 = \dfrac{SSB}{SST} = \dfrac{5.3299}{26.2574} = 0.202986$

Problem 5

$$T_{oc} = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{S_p^2 \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}} = \frac{5.5835 - 4.88727}{\sqrt{(0.3547)\left(\frac{1}{20} + \frac{1}{22} \right)}} = 3.7838$$

$$S_p^2 = MSE = 0.3547$$

$$d.o.f = n - k = 59$$

$$H_0: \mu_1 = \mu_2$$

$$H_A: \mu_1 \neq \mu_2$$

p-value: $2[1 - pt(3.7838, 59)] \simeq 5 \times 10^{-4}$

Since p-value < 0.05 reject the null hypothesis that organize and comfort have the same mean