Assignment 3

S4 | Khan, Moshiur Rahman
18-36303-1
[redacted]

10.2

H_0 vs H_1

Test state $\chi^2 = \sum \frac{O_i^2}{E_i} - n = \frac{1}{51.5}[50^2+42^2+82^2+32^2] - 206$

$= 27.25$

$E_i = \frac{n}{k} = \frac{206}{4} = 51.5$

Since, $\chi^2 > \chi^2_{(k-1)} = \chi^2_3 = -31.1$

~~if so~~ we can say H_0 is not accepted as the value is significantly different between the pairs, hence, road accidents in varying highways is different.

10.4

H_0 vs H_1 : at least one of the female students doesn't meet the test state.

Test state,

$\chi^2 = \sum \frac{O_i^2}{E_i} - n \qquad E_i = \frac{n}{k} = \frac{1000}{4} = 250$

$= \frac{1}{250}[250^2 + 450^2 + 150^2 + 150^2] - 1000$

$= 240$

$\chi^2_{(k-1)} = \chi^2_3 = \frac{1}{333.33}[310000] - 1000 \qquad E_i = \frac{n}{k} = 333.33$

$= -69.99$

Since χ^2_3 is a negative value, we can reject H_0 as the the values are significantly different from the pairs, ~~cont~~ Concluding that the number of females are not similar in various departments.

S.no. 4

10.5

$x \sim N(\mu, \sigma^2)$

$H_0 : \mu = \mu_0 = 21$ vs $H_1 : \mu \neq \mu_0$

$\therefore \bar{x} = \frac{1}{n} \Sigma x$

$= \frac{1}{36} \times 761.6 = 21.15$

$S^2 = \frac{1}{n-1} \left[\Sigma x^2 - \frac{(\Sigma x)^2}{n} \right] = 0.39$

Test statistic,

$$Z = \frac{\bar{x} - \mu_0}{S/\sqrt{n}} = \frac{21.15 - 21}{\frac{0.63}{\sqrt{36}}} = 1.42$$

Since $Z < Z_{(0.1)}$, H_0 is accepted which means population mean is 21.

10.7

$H_0 : P = P_0 = 0.40$ vs $H_1 = P \neq P_0$

$P = \frac{a}{n} = \frac{8}{25} = 0.32$

$Q_0 = 1 - P_0 = 0.60$

Test statistic : $|Z| = \left| \frac{P - P_0}{\sqrt{\frac{P_0 Q_0}{n}}} \right| = \left| \frac{0.32 - 0.40}{\sqrt{\frac{0.4 \times 0.6}{25}}} \right| = 0.81$

Since, $|Z| < 1.96$ H_0 is accepted so it can be considered the overall proportion of female students is 0.40.

10.9

$Z : \frac{P_1 - P_2}{\sqrt{PQ\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}} \sim N(0,1)$ $H_0 : P_1 = P_2$ vs $H_1 : P_1 \neq P_2$

$P = \frac{25 + 18}{100 + 125} = 0.19$

$Q = 1 - P = 0.81$

$P_1 = \frac{25}{100} = 0.25$; $P_2 = \frac{18}{125} = 0.14$ $\therefore |Z| = \left| \frac{0.25 - 0.14}{\sqrt{(0.19)(0.81)\left(\frac{1}{100} + \frac{1}{125}\right)}} \right|$

$= 12.09$

since $|Z| > 1.96$, H_0 is rejected.