Naveen Thomas

Statistics Assignment - 4

(1)

	High School	Bachelors	Masters	Phd	Total
Female	O: 60, E: 51	O: 54, E: 50	O: 46, E: 50	O: 41, E: 50	201
Male	O: 40, E: 49	O: 44, E: 48	O: 53, E: 49	O: 57, E: 48	194
Total	100	98	99	98	395

H_0: There is no relationship between gender of an individual and the level of education that they have obtained.

H_1: There is relationship between gender of an individual and the level of education that they have obtained

$$\chi^2_{test} = \sum \frac{(O-E)^2}{E} = \frac{(60-51)^2}{51} + \dots + \frac{(57-48)^2}{48} = 7.8486$$

$$\chi^2_{critical\ 0.05,3} = 7.815$$

Since $\chi^2_{test} > \chi^2_{critical}$

$\Rightarrow$ Reject H_0

$\Rightarrow$ There is relationship between gender of an individual & the level of education that they have obtained.

(2)

	G_1	G_2	G_3	$(G_1 - G_{1mean})^2$	$(G_2 - G_{2mean})^2$	$(G_3 - G_{3mean})^2$
	51	23	56	7.84	153.76	190.44
	45	43	76	10.24	57.76	38.44
	33	23	74	231.04	153.76	17.64
	45	43	87	10.24	57.76	295.84
	67	45	56	353.44	92.16	190.44
Total	241	177	349	612.8	515.2	732.8
Mean	48.2	35.4	69.8			

$G_{1mean} = \frac{241}{5} = 48.2$ $\quad G_{2mean} = \frac{177}{5} = 35.4$ $\quad G_{3mean} = \frac{349}{5} = 69.8$

$SS_{within} = 612.8 + 515.2 + 732.8 = 1860.8$

$MSE_{within} = \frac{SS_{within}}{dof} = \frac{1860.8}{15-3} = 155.07$

$\text{Grand Mean} = \dfrac{48.2 + 35.4 + 69.8}{3} = 51.13$

$SS_{between} = 5(48.2 - 51.13)^2 + 5(35.4 - 51.13)^2 + 5(69.8 - 51.13)^2$

$= 3022.93$

$MSST = \dfrac{SS_{between}}{d.f} = \dfrac{3022.93}{3-1} = 1511.46$

$F_{stat} = \dfrac{MSST}{MSSE} = \dfrac{1511.46}{155.07} = 9.75$ //

$F_{critical\ 0.05\ (2,12)} = 3.8853$

Since $F_{stat} > F_{critical}$

$\Rightarrow$ Reject H_0

(3) First set $\rightarrow$ 10, 20, 30, 40, 50

$\text{Mean} = \dfrac{150}{5} = 30$

$\text{Variance} = \dfrac{(10-30)^2 + (20-30)^2 + \cdots + (50-30)^2}{5-1} = 250$

Second set $\rightarrow$ 5, 10, 15, 20, 25

$\text{Mean} = \dfrac{75}{5} = 15$

$\text{Variance} = \dfrac{(5-15)^2 + (10-15)^2 + \cdots + (25-15)^2}{5-1} = \dfrac{250}{4} = 62.5$

$F_{test} = \dfrac{\text{Variance of first set}}{\text{Variance of second set}} = \dfrac{250}{62.5} = 4$ //