# Assignment - 4

③

Ans:

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

$H_1$: At least two means are different

| $x_{1j}$ | $x_{2j}$ | $x_{3j}$ | $(x_{1j} - \bar{x}_1)^2$ | $(x_{2j} - \bar{x}_2)^2$ | $(x_{3j} - \bar{x}_3)^2$ |
|---|---|---|---|---|---|
| 10 | 5 | 10 | 400 | 100 | 400 |
| 20 | 10 | 20 | 100 | 25 | 100 |
| 30 | 15 | 30 | 0 | 0 | 0 |
| 40 | 20 | 40 | 100 | 25 | 100 |
| 50 | 25 | 50 | 400 | 100 | 400 |
| 150 | 75 | 150 | 1000 | 250 | 1000 |

$\bar{x}_1 = \frac{150}{5} = 30$ $\quad n_1 = 5$

$\bar{x}_2 = 75/5 = 15$ $\quad n_2 = 5$

$\bar{x}_3 = 150/5 = 30$ $\quad n_3 = 5$.

$\bar{x} = \frac{\text{Grand total}}{\text{Total no of observation}}$

$= 375/15 = 25$

Sum of Squares within Samples

$= \Sigma (x_{1j} - \bar{x}_1)^2 + \Sigma (x_{2j} - \bar{x}_2)^2 + \Sigma (x_{3j} - \bar{x}_3)^2$

$= 1000 + 250 + 1000 + 2250$

Sum of Squares of btw Samples

$= n_1 (\bar{x}_1 - \bar{x})^2 + n_2 (\bar{x}_2 - \bar{x})^2 + n_3 (\bar{x}_3 - \bar{x})^2$

$= 5 (30 - 25)^2 + 5 (15 - 25)^2 + 5 (30 - 25)^2$

3 Cells = $5 \times 25 + 5 \times 100 + 5 \times 25$

$= 750$

total Sum of Squares

| $X_{ij}$ | $X_{2j}$ | $X_{3j}$ | $(X_{ij} - \bar{X})^2$ | $(X_{2j} - \bar{X})^2$ | $(X_{3j} - \bar{X})^2$ |
|---|---|---|---|---|---|
| 10 | 5 | 10 | 225 | 400 | 225 |
| 20 | 10 | 20 | 25 | 225 | 25 |
| 30 | 15 | 30 | 25 | 100 | 25 |
| 40 | 20 | 40 | 225 | 25 | 225 |
| 50 | 25 | 50 | 625 | 0 | 625 |
| | | | 1125 | 750 | 1125 |

total Sum of Squares (TSS) = $\Sigma (X_{1j} - \bar{X})^2 + \Sigma (X_{2j} - \bar{X})^2 + \Sigma (X_{3j} - \bar{X})^2$

$= 1125 + 750 + 1125$

$= 3000$

| Source of variation | df | Sum of Squares | means | F (variance ratio) |
|---|---|---|---|---|
| B/w Samples | 3-1=2 | 750 | 375 | 2. |
| within Samples | 15-3=12 | 2250 | 187.5 | |
| total | 14 | 3000 | | |

No level of Significance is mentioned so, in general we take 0.05 ie.

Critical value $F_{(2,12),0.05} = 3.89$

Calculated value of $F = 2$

Calculated value < Critical value.

∴ We fail to reject null hypothesis

∴ $\mu_1 = \mu_2 = \mu_3$

All means are Equal.