Flipped Assignment: 07

Name:
(1) Md Ariful Haque Miah
(2) Ayodeji Ayoola Date: 09/20/22

Ans to the Ques: (a)

This experiment represents a CRD because the sampling order (no. of observations) is random across all the populations (types of car).
Also the types of car (which is populations) size is more than 2.50 it's a CRD.

Ans to the Ques (b)

The type of car is a fixed effect since there are 4 types of car which assigns the discrete property.

Ans to the Qus (c)

Linear effects equation:

$$y_{ij} = \bar{y}_{..} + \tau_i + \epsilon_{ij} \qquad \epsilon_{ij} \sim N(0, \sigma^2)$$

- y_{ij} = jth observations from the population (type of car)

$\bar{y}_{..}$ = grand mean

τ_i = effect of population (type of car)
^fixed

ϵ_{ij} = random error $\sim N(0, \sigma^2)$.

Ans to the Qus (d)

Hypothesis:

$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$

H_a: at least one of the μ_i differs
$i = 1, 2, 3, 4$

μ_1 = mean observations (rental period days) of subcompact car
μ_2 = " " " " Compact car
μ_3 = " " " " Midsize car
μ_4 = " " " " Full size car

Ans to Qns No:- (e)

Grand mean, $\bar{y}_{..} = \frac{\bar{y}_{1.} + \bar{y}_{2.} + \bar{y}_{3.} + \bar{y}_{4.}}{I}$

where, $\bar{y}_{1.}$ = mean of subcompact car = 4.1

$\bar{y}_{2.}$ = " " Compact " = 3.9

$\bar{y}_{3.}$ = " " midsize " = 3.6

$\bar{y}_{4.}$ = " " full size " = 5.3

$\bar{y}_{..}$ = Grand mean

I = types of car = 4

$$\therefore \bar{y}_{..} = \frac{4.1 + 3.9 + 3.6 + 5.3}{4} = 4.23$$

Ans to the Qns No. (f)

$\bar{y}_{1.}$ = mean of subcompact car rental length = 4.1

$\bar{y}_{2.}$ = " " compact " " " = 3.9

$\bar{y}_{3.}$ = " " midsize " " " = 3.6

$\bar{y}_{4.}$ = " " full size " " = 5.3

Ans to the Ques NO: (G)

$$MSE = \frac{SSE}{I(J-1)}$$

$$SSE = \sum_i \sum_j (y_{ij} - \bar{y}_{i.})^2$$

$$= 180.3 \text{ (using excel)}$$

$$\therefore MSE = \frac{180.3}{4(10-1)} = 5.008$$

Ans to the Ques NO: (H)

$$MST_\gamma = \frac{SST_\gamma}{I-1}$$

$$SST_\gamma = J \times \sum_j (\bar{y}_{i.} - \bar{y}_{..})^2$$

$$= 10 \times 1.66 \text{ (from excel)}$$

$$= 16.67$$

$$MST_\gamma = \frac{16.67}{3} = 5.56$$

Ans to The Ques No: (I)

MSTr & MSE values are approximately same so ~~we accept~~ might it indicates ~~we~~ H_0 might not reject.
So we need to go to find F-value to make final decisions regarding hypothesis.

Ans to The Ques No: (J)

$$F = \frac{MSTr}{MSE} = \frac{5.56}{5.008} = 1.11$$

~~Ans~~ corresponding to the hypotheisis in part (d), value of F-statistics is 1.11.

Ans to the Que No: (K)

Using R, critical value = 2.866 at $\alpha = 0.05$ level of significance.

$\therefore$ F-stat < critical value (2.8666)

(1.11)

So we fail to reject the Null hypothesis H_0 which means type of car rental does not have effect on the length of the rental period.