ASSIGNMENT 4

Date

Q) In a small scale regression study, the following data were obtained.

y	42	33	75	28	91	55
x_1	7	4	16	3	21	8
x_2	33	41	7	49	5	31

a) Calculate line of best fit.
b) Calculate R^2 and R^2
c) Calculate adjusted R^2 & state the importance of adjusted R^2 in multiple regression.

Solution:-

a) Line Of Best Fit:-

$$\hat{Y} = b_0 + b_1 x_1 + b_2 x_2$$

$$\therefore b_1 = \frac{(\Sigma x_2^2)(\Sigma x_1 y) - (\Sigma x_1 x_2)(\Sigma x_2 y)}{(\Sigma x_1^2)(\Sigma x_2^2) - (\Sigma x_1 x_2)^2}$$

$$\Sigma x_1^2 = \Sigma x_1^2 - (\Sigma x_1)^2/N$$

$$\Sigma x_2^2 = \Sigma x_2^2 - (\Sigma x_2)^2/N$$

$$\Sigma x_1 y = \Sigma x_1 y - \frac{\Sigma x_1 \Sigma y}{N}$$

$$\Sigma x_1 x_2 = \Sigma x_1 x_2 - \frac{\Sigma x_1 \Sigma x}{N}$$

$$b_1 = \frac{(1613.33)(875) - (-625.33)(-2168)}{(254.83)(1613.3) - (-625.33)}$$

$$\boxed{b_1 = 0.13588}$$

$$\therefore b_2 = \frac{(\Sigma x_1)^2(\Sigma x_2 y) - (\Sigma x_1 x_2)(\Sigma x_1 y)}{(\Sigma x_1^2)(\Sigma x_2^2) - (\Sigma x_1 x_2)^2}$$

$$b_2 = \frac{(254.833)(-2168) - (-625.33)(875)}{(254.833)(1613.33) - (-625.33)}$$

$$\boxed{b_2 = -0.0129}$$

Teacher's Signature.

$$\therefore b_0 = \bar{y} - b_1\bar{x}_1 - b_2\bar{x}_2$$

$$b_0 = \frac{324}{6} - (0.13588)\left(\frac{59}{6}\right) - (-0.0129)\left(\frac{166}{6}\right)$$

$$\boxed{b_0 = 53.02}$$

$$\underline{\hat{y} = 53.02 + 0.13588\,x_1 - 0.0129\,x_2}$$

b) R^2 & R

$$Corr(x,y) = r_{y_1} = r_1 = \frac{n\Sigma x_1 y - \Sigma x_1 \Sigma y}{\sqrt{n\Sigma x_1^2 - (\Sigma x_1)^2}\sqrt{n\Sigma y^2 - (\Sigma y)^2}}$$

$$\underline{r_{y_1}} = \frac{(6)(4061) - (59)(324)}{\sqrt{6(835) - (59)^2}\sqrt{6(20568) - (324)^2}} \Rightarrow \underline{0.9889}$$

$$Corr(x_2 y) = \underline{r_{y_2} = -0.9738}$$

$$Corr(x_1 x_2) = \underline{r_{12} = -0.9752}$$

$$R^2 = \left[(r_{y_1})^2 + (r_{y_2})^2 - 2\,r_{y_1} r_{y_2} r_{12}\right] / 1 - r_{12}^2$$

$$R^2 = \frac{(0.9889)^2 + (-0.9738)^2 - 2(0.9889)(-0.9738)(-0.9752)}{1 - (-0.9752)^2}$$

$$\boxed{R^2 = 0.9793}$$

$$\boxed{R = 0.989}$$

c) Adjusted R^2

$$\text{Adjusted } R^2 = 1 - \left(\frac{n-1}{n-(K+1)}\right)(1-R^2)$$

$\therefore$ K is predict variables are x_1 & x_2

$$\text{Adjusted } R^2 = 1 - \left(\frac{6-1}{6-(2+1)}\right)(1-0.9793)$$

Adjusted R^2 = 0.9655

Importance Of Adjusted R^2 In Multiple Regression Model:

Statement:-

Adjusted R^2 is used to determine how reliable the correlation is & how much it is determined by the addition of independent variable.