

Assignment-2

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Subject - Probability & Statistics - 2

Roll no - 66

Section - FY - BSc [B]

Solⁿ ① $\Sigma x = 850$

(a) $\Sigma x^2 = 925000$

$\Sigma y = 1737$

$\Sigma y^2 = 372717$

$\Sigma xy = 182560$

$S_{xx} = 852750$

$S_{yy} = 71000.1$

$S_{xy} = 34915$

$\alpha = 0.040944 \quad 170.217$

$\beta = 0.040944$

$\hat{y} = 170.217 + 0.040944x$

(b) Gradient of the Regression line is $170.217 [x]$.
which is significant.

Solⁿ 2 $\Sigma x = 385.2$

(i) $\Sigma x^2 = 13666.58$

$\Sigma y = 1162.5$

$\Sigma y^2 = 119,026.9$

$\Sigma xy = 38191.41$

$S_{xx} = 301.66$

$S_{yy} = 6409.7125$

$S_{xy} = 875.16$

$B = 2.9011$

$a = 3.7496$

$$\hat{y} = 3.7496 + 2.9011x$$

(ii) $s^2 = \frac{1}{10} \left[6409.7125 - \frac{875.16^2}{301.66} \right] = 387.0745$

CI: $2.9011 \pm 2.228 \times 1.933$

$(0.3771, 5.4251)$

$$(iii) Y \sim N \left[\alpha + Bx, \frac{1}{n} + \frac{(\bar{x}_0 - \bar{x})^2}{S_{xx}} \right] \sigma^2$$

$$CI = \left[\alpha + Bx \pm t_{\alpha/2, n-2} \sqrt{\frac{1}{n} + \frac{(\bar{x}_0 - \bar{x})^2}{S_{xx}}} \sigma^2 \right]$$

$$= 119.7936 \pm 22.1427$$

$$(97.6504, 141.9306)$$

Solⁿ 6 $\Sigma x = 39$

$$\Sigma y = 562$$

$$\Sigma xy = 2853$$

$$\Sigma y^2 = 40508$$

$$\Sigma x^2 = 207$$

$$(i) r_c = \frac{S_{xx}}{\sqrt{S_{xx} \cdot S_{yy}}} = 0.9447$$

$$(ii) B = 12.0437$$

$$\alpha = 9.2296$$

$$\hat{y} = 9.2296 + 12.0437x$$

Solⁿ 5

$$(iii) SS_{reg} = \frac{S_{xy}^2}{S_{xx}}$$

$$= 7963.30$$

$$SS_{res} = S_{yy} - \frac{S_{xy}^2}{S_{xx}}$$

$$= 960.295$$

$$(iv) R^2 = 0.8924$$

Solⁿ 7

$$\Sigma x = 174.13$$

$$\Sigma x^2 = 7545.90$$

$$\Sigma y = 197.84$$

$$\Sigma y^2 = 4747.45$$

$$S_{xy} = 2176.84$$

$$S_{xx} = 4789.4221$$

$$S_{yy} = 1189.2076$$

$$\beta = 2.2002$$

$$\alpha = -16.8432$$

$$\hat{y} = -16.8432 + 2.2002x$$

$H_0: \beta = 0$
 $H_1: \beta \neq 0$

$$s^2 = 199.8121$$

$$T.S = 10.77176$$

$$Z_{\text{tab}} = 2.776$$

Here Reject H_0 .

There is linear relationship btwn x & y .

(iii) $r = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}} = 0.912128$

Sol^{wq}
 $\Sigma x = 45$
 $\Sigma x^2 = 277.5$
 $\Sigma y = 644$
 $\Sigma y^2 = 43956$
 $\Sigma xy = 2602$

$$S_{xx} = 75$$

$$S_{yy} = 2482.4$$

$$S_{xy} = -296$$

(i) Based on the plot there seem to be negative linear correlation between them

(ii) $r = \frac{S_{xy}}{\sqrt{S_{xx} S_{yy}}} = -0.686$

(iii) $\tanh^{-1}(r) \sim N(\tanh^{-1} \rho, \frac{1}{n-3})$

$H_0: \rho = 0$

$H_1: \rho < 0$

$$\frac{\tanh^{-1} r - \tanh^{-1} \rho}{\sqrt{\frac{1}{n-3}}} = Z_{cal}$$

$Z_{cal} = -2.2289$

$Z_{cr} = \pm 1.96$ at 5% LOS

$Z_{cr} = \pm 2.5758$ at 0.5% LOS

The is negative correlated at 5% LOS

The is no correlation at 1% LOS

Solⁿ 3

$$S_{tot} = 1116.11$$

$$S_{reg} = 516.11$$

$$S_{res} = 600$$

Subject	degree of freedom	SS	MSS
Reg	3	516.11	172.04
Res	24	600	25
	27	1116.11	

$$F_{cal} = \frac{172.04}{25} = 6.88$$

$$F_{cal}(3, 24, 5\%) = 3.009$$

Reject H_0 Solⁿ 4

(9)

$$\sum Y_i = 1856$$

$$\sum Y_i^2 = 174316$$

$$DF = 104385.94$$

$$S_{tot} = 69930.06$$

$$S_{reg} = 22325.69$$

$$S_{res} = 47604.37$$

$$F_{cal} = \frac{22325.69}{47604.37} = 3.283$$

$$F_{tab} = 2.714$$

Reject H_0

(ii) T.S = 49.91146 $\chi^2_{0.05, 1} = 12.59$ [reject H_0]

Solⁿ 10

$$S_{xx} = 0.042$$

$$S_{yy} = 0.00126$$

$$S_{xy} = 0.0022$$

$$SS_{reg} = 0.00115$$

$$SS_{res} = 0.00011$$

Subject	degree of freedom	SS	MSS
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Reg	1	0.00115	0.00115
Res	1	0.00011	0.00011
	2	0.00126	

$$H_0: \beta = 0$$

$$H_1: \beta \neq 0$$

$$T.S = 10.454$$

$$F_{1,1, 5\%} = 161.4$$

do not reject H_0 .