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Roll No. - 1

Date: __/__/____
MON TUE WED THR FRI SAT SUN

Probability & Stats.
Assignment - II

Q1. (a.) $\Sigma x^2 = 328000$ $\Sigma x = 850$
$\Sigma y^2 = 372717$ $\Sigma y = 1737$
$\Sigma xy = 1825600$

$S_{xx} = 852750$
$S_{yy} = 71000$
$S_{xy} = 34915$

$\beta = 0.040944$
$\alpha = 170.219$
$\therefore$ Eq^n. $= \alpha + \beta x$
$= 170.219 + 0.040944x$

(b.) $\because \beta = 0.040944$
i.e., β is close to 0
Hence, it is not significant

Q2. (i.) $\Sigma x^2 = 12666.58$ $\Sigma x = 385.2$
$\Sigma y^2 = 119026.9$ $\Sigma y = 1162.5$
$\Sigma xy = 38191.41$

$S_{xx} = 901.66$
$S_{yy} = 875.16$
$S_{xy} = 6409.7125$

$\beta = 2.9011$
$\alpha = 3.7496$
$\therefore$ Eq^n. $= 3.7496 + 2.9011x$

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(ii) $\sigma^2 = 387.0744$

$\hat{\beta} \sim N(\beta, \sigma^2/S_{xx})$

95% C.I.

$= \beta + t_{2.5\%, 12}\left(\frac{\sigma}{\sqrt{S_{xx}}}\right)$

$= 2.9011 \pm (2.228)(1.182)$

$= (0.379, 5.423)$

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

C.I. $= \mu_0 \pm t_{\alpha/2, n-2}\sqrt{\left(\frac{1}{n} + \frac{(x_0-\bar{x})^2}{S_{xx}}\right)\sigma^2}$

$= 119.7936 \pm 22.143$

$= (97.6504, 141.93)$

Qs. (i) In city A & city B, it takes longer while travelling in peak hours. While in city C the time diff. is similar where as in city D, we might reach early.

Q6. $\Sigma x = 39$ $\quad \Sigma x^2 = 207$

$\Sigma y = 562$ $\quad \Sigma y^2 = 40508$

$\Sigma xy = 2855$

$S_{xx} = 54.9$

$S_{yy} = 3923.6$

$S_{xy} = 661.9$

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(i.) $r = \frac{S_{xy}}{\sqrt{S_{xx} \cdot S_{yy}}} = 0.944662$

(ii.) $\beta = 12.0437$

$\alpha = 9.22957$

$\therefore$ Eqn. $= 9.22957 + 12.0437x$

(iii.) $SS_{TOT} = SS_{REG} + SS_{RES}$

$SS_{RES} = \frac{S^2_{xy}}{S_{xx}} = 7963.30$

$SS_{RES} = S_{yy} - \frac{S^2_{xy}}{S_{xx}} = 960.295$

$\therefore SS_{TOT} = 7963.30 + 960.295$

$= 8923.595$

(iv.) $R^2 = \frac{S^2_{xy}}{S_{xx} \cdot S_{yy}} = r^2 = 0.8923$

Q7. $\Sigma x^2 = 7545.90$ $\quad \Sigma x = 174.13$

$\Sigma y^2 = 4747.45$ $\quad \Sigma y = 187.84$

$S_{xy} = 2176.84$

$S_{xx} = 4789.4221$

$S_{yy} = 1189.2079$

(i.) $\beta = \frac{S_{xy}}{S_{xx}} = 2.20017$

$\alpha = -16.8432$

$\hat{y} = -16.8432 + 2.20017x$

(iii) $H_0 : \beta = 0$ V/S $H_1 : \beta \neq 1$

$\hat{\sigma}^2 = 139.8121$

$t_{cal} = \dfrac{\hat{\beta} - \beta}{\hat{\sigma}/\sqrt{S_{xx}}} = 10.77176$

$t_{tab} = 2.776$

$t_{cal} > t_{tab}$

∴ Reject H_0

∴ There is linear relationship between X & Y.

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

Q. $\Sigma x^2 = 277.5$ $\Sigma x = 45$

$\Sigma y^2 = 4395.6$ $\Sigma y = 644$

$\Sigma xy = 2602$

$S_{xx} = 75$

$S_{yy} = 2482.4$

$S_{xy} = -296$

(i) Looking at the plot, a negative correlation between X & Y can be seen.

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

∴ There is a strong negative correlation.

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

$H_0 : \rho = 0$ V/S $H_1 : \rho < 0$

$$Z_{cal} = \frac{\tanh^{-1} r - \tanh^{-1}\rho}{\sqrt{\frac{1}{n-3}}} = \frac{-0.84036 - 0}{\sqrt{\frac{1}{10-3}}}$$

$$= -2.22338$$

$Z_{tab} \Rightarrow \pm 1.96 = Z_{2.6\%}$

$\Rightarrow \pm 2.5758 = Z_{0.6\%}$

$\therefore$ at 5% level of significance, we reject H_0.

$\therefore$ We do not reject H_0 at 1% level of significance

$\Rightarrow$ There is a negative correlation at 5% level of significance.

$\Rightarrow$ There is no correlation at 1% level of significance.

Note:-

Doubts = Q3, Q4, Q5, Q8, Q10