ABHISHEK SRIVASTAVA
19BCE10071

ASSIGNMENT-3

Q.1)

x	y	x^2	y^2	xy
5	16	25	256	80
10	19	100	361	190
15	23	225	529	345
20	26	400	676	520
25	30	625	900	750
$\Sigma x = 75$	$\Sigma y = 114$	$\Sigma x^2 = 1375$	$\Sigma y^2 = 2722$	$\Sigma xy = 1885$

$$r_{xy} = \frac{n\Sigma xy - \Sigma x \cdot \Sigma y}{\sqrt{(n\Sigma x^2 - (\Sigma x)^2)(n\Sigma y^2 - (\Sigma y)^2)}}$$

$$= \frac{5 \times 1885 - (75 \times 114)}{\sqrt{(5 \times 1375 - (75)^2)(5 \times 2722 - (114)^2)}}$$

$$\therefore \boxed{r_{xy} = 0.9988}$$

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Q.2)

x	y	$x-\bar{x}$	$y-\bar{y}$	$(x-\bar{x})^2$	$(y-\bar{y})^2$
23	18	-4.5	-4.833	20.250	23.361
27	20	-0.5	-2.833	0.250	8.028
28	22	0.5	-0.833	0.250	0.694
28	27	0.5	4.167	0.250	17.361
29	21	1.5	-1.833	2.250	3.361
30	29	2.5	6.167	6.250	38.028
$\Sigma x = 165$	$\Sigma y = 137$	$\bar{x} = 27.5$	$\bar{y} = 22.833$	$\Sigma(x-\bar{x})^2 = 29.5$	$\Sigma(y-\bar{y})^2 = 90.833$

→ For x-values,

$\Sigma = 165$

$\therefore$ Mean$(\bar{x}) = 27.5$

$\therefore \Sigma(x-\bar{x})^2 = 29.5$

→ For y-values,

$\Sigma = 137$

$\therefore$ Mean$(\bar{y}) = 22.833$

$\therefore \Sigma(y-\bar{y})^2 = 90.833$

and, $N = 6$

$\Sigma(x-\bar{x})(y-\bar{y}) = 37.5$

Now,

$$cov(x,y) = \frac{\Sigma(x-\bar{x})(y-\bar{y})}{N}$$

$$= \frac{37.5}{6}$$

$$= 6.25$$

→ $\sigma_x = \sqrt{\frac{\Sigma(x-\bar{x})^2}{N}}$

$= \sqrt{\frac{29.5}{6}}$

$= 2.217$

→ $\sigma_y = \sqrt{\frac{\Sigma(y-\bar{y})^2}{N}}$

$= \sqrt{\frac{90.833}{6}}$

$= 3.890$

~~Now,~~

$\cancel{r = \frac{cov(x,y)}{\sigma_x \sigma_y}}$

$\cancel{= \frac{6.25}{(0.905)(1.588)}}$

$\cancel{=}$

Now,

$$r_{xy} = \frac{cov(x,y)}{\sigma_x \sigma_y}$$

$$= \frac{6.25}{(2.217)(3.890)}$$

$$\therefore \boxed{r_{xy} = 0.7247}$$

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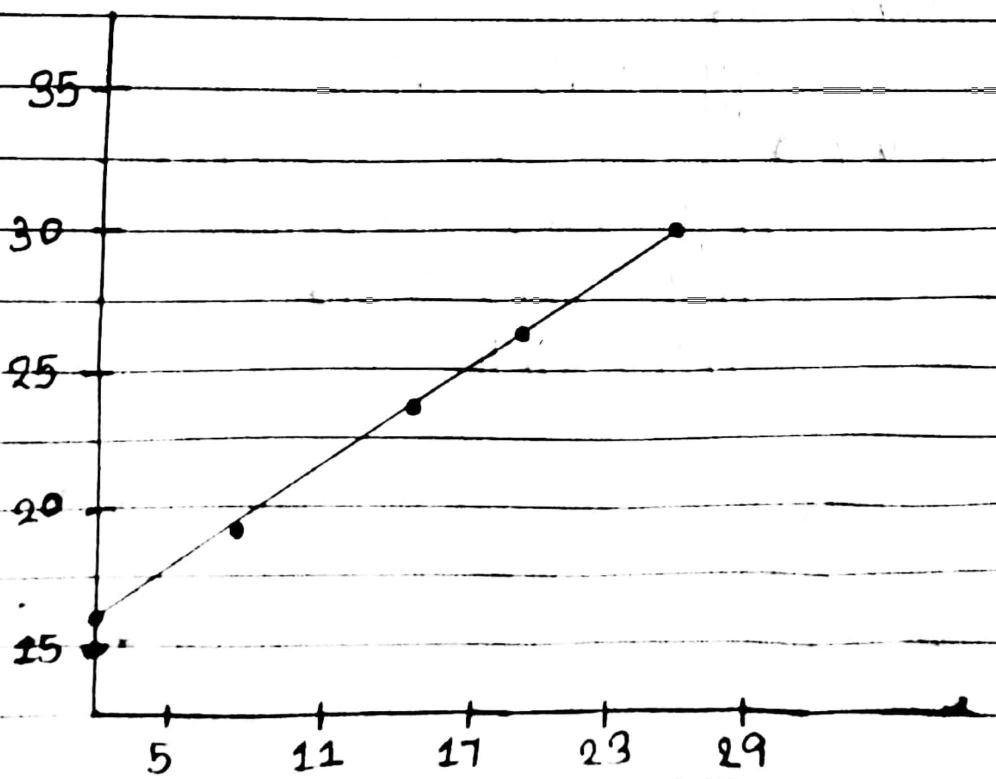
Q.3)

x	y	x^2	y^2	xy
5	16	25	256	80
10	19	100	361	190
15	23	225	529	345
20	26	400	676	520
25	30	625	900	750

$\Sigma x = 75$ $\quad \Sigma y = 114$ $\quad \Sigma x^2 = 1375$ $\quad \Sigma y^2 = 2722$ $\quad \Sigma xy = 1885$



Since, it is a straight line.

$\therefore$ the eqⁿ of straight line will be:

$$y = a + bx \ ; \ a \,\&\, b \text{ are constants} \quad -(1)$$

By the method of least squares, we write the normal eqⁿ for eqⁿ (1),

$$\rightarrow \Sigma y = an + b\Sigma x \quad -(2)$$

$$\Sigma xy = a\Sigma x + b\Sigma x^2 \quad -(3)$$

we have,

$\Sigma x = 75$, $\Sigma y = 114$, $\Sigma x^2 = 1375$, $\Sigma y^2 = 2722$, $\Sigma xy = 1885$

putting these values in eqⁿ (2) & (3) we get,

$$\rightarrow 114 = 5a + 75b$$

$$1885 = 75a + 1375b$$

solving above eqⁿ we get,

$$a = \frac{123}{10} = 12.3$$

$$b = \frac{7}{10} = 0.7$$

$\therefore$ equation is,

$$\rightarrow \boxed{y = 12.3 + 0.7x}$$

putting $x = 18$ (in) above eqⁿ,

$$\therefore y = 12.3 + 0.7(18)$$

$$\therefore y = 12.3 + 12.6$$

$$\therefore \boxed{y = 24.9}$$

Q.4.)

Given: $3x + 12y = 19$

$3y + 9x = 46$

(i) Since, we don't know which of the two eq^n is the regression eq^n of Y on X and which one is regression eq^n of X on Y.

Let us tentatively assume that the first eq^n is the regression line of X on Y and the second eq^n is the regression line of Y on X.

$\therefore$ First eq^n can be written as,

$$\Rightarrow x = \frac{19}{3} - 4y$$

and, $y = \frac{46}{3} - 3x$

then $b_{xy} = -4$ and $b_{yx} = -3$

$\therefore r_{xy}^2 = b_{xy} \times b_{yx} = (-4) \times (-3) = 12$

$\therefore r_{xy} = 3.46$, which is not possible

Hence, our tentative assumption is wrong.

∴ The first eqⁿ is the regression line of Y on X and ~~xxx~~ re-written as,

$$\rightarrow y = \frac{19}{12} - \frac{1}{4}x$$

and, the second eqⁿ is the regression line of X on Y and re-written ~~as~~,

$$\rightarrow x = \frac{46}{9} - \cancel{\frac{3}{46}y} \; \frac{1}{3}y$$

Hence, the correct $b_{yx} = -\frac{1}{4}$

and the correct $b_{xy} = \cancel{\frac{-3}{46}} \; -\frac{1}{3}$

$$\therefore r_{xy}^2 = b_{yx} \times b_{xy}$$

$$= \frac{-1}{4} \times \cancel{\frac{-3}{46}} \; \frac{-1}{3}$$

$$\therefore \boxed{r_{xy} = ~~xxx~~\ 0.29}$$

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Q.5.)

(a) From the given data,

$n = 9$, $\Sigma x = 711$, $\Sigma y = 664$
$\Sigma xy = 53845$, $\Sigma x^2 = 57915$, $\Sigma y^2 = 52494$

then, $\bar{x} = \dfrac{\Sigma x}{n} = \dfrac{711}{9} = 79$

and, $\bar{y} = \dfrac{\Sigma y}{n} = \dfrac{664}{9} = 73.78$

$$b_{yx} = \frac{n\Sigma xy - \Sigma x \cdot \Sigma y}{n\Sigma x^2 - (\Sigma x)^2}$$

$$= \frac{(9 \times 53845) - (711 \times 664)}{(9 \times 57915) - (711)^2}$$

$$= \frac{12501}{15714}$$

$$= 0.7955$$

∴ The regression eqⁿ is,

$\rightarrow y - \bar{y} = b_{yx}(x - \bar{x})$

$\therefore y - 73.78 = 0.7955(x - 79)$

$\therefore y = 0.7955x - 62.8445 + 73.78$

$\therefore \boxed{y = 0.7955x + 10.9355}$

taking $x = 85$,

$\therefore y = 0.7955(85) + 10.9355$

$\therefore \boxed{y = 78.889}$, final examinationn grade