Regression Analysis

1. If the regression coefficients are 0.8 and 0.2, what would be the value of coefficient of correlation.

Ans: 0.4

2. Calculate linear regression coefficients from the following:

x	1	2	3	4	5	6	7	8
y	3	7	10	12	14	17	20	24

Ans: $b_{yx} = 2.7976$ $b_{xy} = 0.3540$

3. The following table gives age (x) in years of cars and annual maintenance cost (y) in hundred rupees

x	1	3	5	7	9
y	15	18	21	23	22

Estimate the maintenance cost for a 4 year old car after finding the regression Eq^n.

Ans: 1885 Rupees

4. In a partially destroyed laboratory record of an analysis of a correlation data, the following results only are legible:

Variance of $x = 9$

Regression Equations: $8x - 10y + 66 = 0$, $40x - 18y = 214$.

What were (I) $\bar{x}$ and $\bar{y}$ (II) the S.D. of y

(III) Coefficient of correlation

Ans: (I) $\bar{x} = 13$, $\bar{y} = 17$

(II) $\sigma_y = 4$

(III) $r = 0.6$

5. The following results were obtained from records of age (x) and blood pressure (y) of a group of 10 men:

	x	y
Mean	53	142
Variance	130	165

and $\Sigma (x - \bar{x})(y - \bar{y}) = 1220$. Find the appropriate regression Equation and use it to estimate the blood pressure of a man whose age is 45.

Ans: $\hat{y} = 0.93846x + 92.26162$, Required blood pressure $= 134.49$

6. The following results were obtained from marks in Applied mechanics and Engineering mathematics in an Examination:

	Applied mechanics (x)	Engg. Math (y)
Mean	47.5	39.5
Standard Deviation	16.8	10.8

$\boxed{x = 0.95}$. Find both the regression Equations.

Also Estimate the value of y for $x = 30$.

Ans: Regression line of y on x, $y = 0.6107\,x + 10.49$

Regression line of x on y $x = 1.4777\,y - 10.8415$

y, when $x = 30$ is 28.81

7. Two lines of regression are given by

$x + 2y - 5 = 0$ and $2x + 3y - 8 = 0$ and $\sigma_x^2 = 12$

Calculate (I) $\bar{x}$ and $\bar{y}$ (II.) the coefficient of correlation κ b/w x & y (III) σ_y

Ans:(I) $\bar{x} = 1$, $\bar{y} = 2$ (II) $\kappa = -\dfrac{\sqrt{3}}{2}$ (III) 4

8. An analyst for a company was studying travelling expenses (y) in rupees and duration (x) of these trips for 102 sales trip. He has found relation b/w x and y is linear and data as follows:

$\Sigma x = 510$ $\Sigma y = 7140$ $\Sigma x^2 = 4150$ $\Sigma xy = 54900$

$\Sigma y^2 = 740200$

Calculate: (I) Two regression lines

(II) A given trip has to take 7 days. How much money should be allowed so that they will not run short of money?

Ans: (I) $y = 12x + 10$ $x = 0.07986y - 0.59068$

(II) 94 Rupees.

9. If the coefficient of correlation b/w two variables x and y is 0.5 and acute angle b/w their line of regression is $\tan^{-1}\left(\frac{3}{5}\right)$, then show that either

$$2\sigma_x = \sigma_y \quad \text{or} \quad 2\sigma_y = \sigma_x$$

Ans: $x = 0.7001...$

10. Can $y = 5 + 2.8x$ and $x = 3 - 0.5y$ be the estimated regression Equations of y on x and x on y respectively? Explain your answer with suitable theoretical arguments.

Ans: NO, $b_{yx} = 2.8$ and $b_{xy} = -0.5$. which is not possible.

11. Given $N = 50$, Mean of $y = 44$. Variance of x is $\frac{9}{16}$ of the variance of y. Regression Equation of x on y is $3y - 5x = -180$. Find

(I) Mean of x

(II) Coefficient of correlation b/w x and y

(Note: $\nabla_x^2 = \frac{9}{16} \nabla_y^2$ (A.T.Q.))

Ans: (I) 62.4   (II) 0.8

THE END