TUTORIAL NO.1.2 : MULTIPLE LINEAR REGRESSION

Date: 06/12/2019

1. In a trivariate distribution, $\sigma_1 = 2$, $\sigma_2 = \sigma_3 = 3$ and $r_{12} = 0.7$, $r_{23} = r_{31} = 0.5$. Find I) $b_{12.3}$ II) $b_{13.2}$

2. Given $r_{12} = 0.28$, $r_{23} = 0.49$, $r_{31} = 0.51$ and $\sigma_1 = 2.7$, $\sigma_2 = 2.4$, $\sigma_3 = 2.7$.
   Find the regression equation of I) x_3 on x_1 and x_2 II) x_2 on x_1 and x_3

3. An instructor of mathematics wishes to determine the relationship of grades on a final examination to grades on two quizzes given during the semester. Costing x1, x2 and X3 the grades of a student on the first quiz, second quiz and final examination respectively, he made the following computations for a total of 120 students.
   $\bar{X}_1 = 6.8$ $\bar{X}_2 = 0.7$ $\bar{X}_3 = 74$
   $S_1 = 1$ $S_2 = 0.8$ $S_3 = 9.0$
   $r_{12} = 0.6$ $r_{13} = 0.7$ $r_{23} = 0.55$
   I) Find the least square regression equation of X_3 on X_1 and X_2.
   II) Estimate the final grades of two students who scored respectively 9 and 7, 4 and 5 on the two quizzes.

4. The following constants are obtained from measurements on length in mm.(X1), volume in c.c. (X2) and weight in gm.(X3) of 300 eggs:
   $\bar{X}_1 = 55.95$ $\bar{X}_2 = 51.48$ $\bar{X}_3 = 56.03$
   $S_1 = 2.26$ $S_2 = 4.39$ $S_3 = 4.41$
   $r_{12} = 0.578$ $r_{13} = 0.581$ $r_{23} = 0.974$
   Obtain the linear regression equation of egg weight on egg length and egg volume. Hence, Estimate the weight of an egg whose length is 58mm. And volume is 52.5 cc.

5. The table shows the corresponding values of three variables, X1, X2 and X3. Find the least square regression equation of X_3 on X_1 and X_2. Estimate X_2 when X_1=10 and X_2=6.

X_1	3	5	6	8	12	14
X_2	16	10	7	4	3	2
X_3	90	72	54	42	30	12

6. Given the following data:

Performance Evaluation	3	5	6	8	12	14
Aptitude Test Score	16	10	7	4	3	2
Prior Experience	90	72	54	42	30	12

   I) Develop the estimating equation best describing these data.
   II) If an employee scored 83 on the aptitude test and had a prior experience of 7, what performance evaluation would be expected?