**Multiple Linear Regression Model**

**Problem:**

A soft drink bottler is analyzing the vending machine service routes in his distribution system. He is interested in predicting the amount of time required by the route driver to service the vending machines in an outlet. This service activity includes stocking the machine beverage products and minor maintenance or housekeeping. The industrial engineer responsible for the study has suggested that the two most important variables affecting the delivery time (Y) are the number of cases of product stocked (X1), and the distance walked by the route driver (X2). The engineer has collected 25 observations on delivery time, which are shown below in the table:

|  |  |  |  |
| --- | --- | --- | --- |
| ObservationNo | DeliveryTimeY | NumberOfCasesX1 | DistanceX2 |
| 1 | 16.68 | 7 | 560 |
| 2 | 11.5 | 3 | 220 |
| 3 | 12.3 | 3 | 340 |
| 4 | 14.88 | 4 | 80 |
| 5 | 13.75 | 6 | 150 |
| 6 | 18.11 | 7 | 330 |
| 7 | 8 | 2 | 110 |
| 8 | 17.83 | 7 | 210 |
| 9 | 79.24 | 30 | 1460 |
| 10 | 21.5 | 5 | 605 |
| 11 | 40.33 | 16 | 688 |
| 12 | 21 | 10 | 215 |
| 13 | 13 | 4 | 255 |
| 14 | 19.75 | 6 | 462 |
| 15 | 24 | 9 | 448 |
| 16 | 29 | 10 | 776 |
| 17 | 15.35 | 6 | 200 |
| 18 | 19 | 7 | 132 |
| 19 | 9.5 | 3 | 36 |
| 20 | 35.1 | 17 | 770 |
| 21 | 17.9 | 10 | 140 |
| 22 | 52.32 | 26 | 810 |
| 23 | 18.75 | 9 | 450 |
| 24 | 19.83 | 8 | 635 |
| 25 | 10.75 | 4 | 150 |

Fit a multiple linear regression to the above data that involving the following steps by using R and interpret the outputs.

1. Estimate the values of the regression coefficients of a multiple linear regression model and establish the relationship between the dependent and independent variables.
2. Obtain the predicted values of Y.
3. Find the values of residuals.
4. Test the significance of the regression coefficients at 5% of level of significance.
5. Obtain the 95 percent and 99 percent confidence interval for partial regression coefficients and intercept term.
6. Is the overall regression model significant at 5% level of significance.
7. Obtain the Coefficient of determination and adjusted coefficient of multiple determination, interpret the result.
8. Predict the Delivery time for the number of cases =8 and distance =275 and obtain the 99% CI for the predicted delivery time.

The evaluation pattern is as follows:

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| Section | Parameters | Marks |
| A | Objective/Aim | 2 |
| B | Analysis | 3 |
| C | Interpretation | 3 |
| D | Timely submission | 2 |
| Total |  | 10 |