ANSWER 1

Assuming A and B to be the elements of the variables A and B respectively, the formula for covariance will be:

$$conv(A,B) = \frac{\sum_{i=1}^{N}(A_i - \bar{A})(B_i - \bar{B})}{N}$$

Here, N = 7. We have also assumed the data to be of the entire population and not the sample.

$$\bar{A} = \frac{\sum_{i=1}^{7} A_i}{7} = 48.15$$

Similarly,

$$\bar{B} = \frac{\sum_{i=1}^{7} B_i}{7} = 46$$

Hence,

$$conv(A,B) = \frac{(25-48.15)(52-46)+(35-48.15)(10-46)+(21-48.15)(5-46)+(67-48.15)(98-46)+(98-48.15)(52-46)+(27-48.15)(36-46)+(64-48.15)(69-46)}{7}$$

$$= \frac{-138.9 + 473.4 + 1113.15 + 980.2 + 299.1 + 211.5 + 364.55}{7} = \frac{3303}{7} = \mathbf{471.857}$$

Correlation of variables A, B =

$$\frac{conv(A,B)}{SD(A)SD(B)}$$

Standard deviation of A =

$$SD(A) = \sqrt{\frac{\sum_{i=1}^{7}(A_i - \bar{A})^2}{7}} = 26.68$$

Similarly, standard deviation of B =

$$SD(B) = \sqrt{\frac{\sum_{i=1}^{7}(B_i - \bar{B})^2}{7}} = 30.2$$

Hence, correlation =

$$\frac{471.857}{26.68 * 30.2} = \mathbf{0.5856}$$

As we can see, the correlation is very high (value ranges from -1 to +1)

ANSWER 2

There are two ways in which we can deal with collinearity/multicollinearity:

1. By getting rid of the redundant variables using a variable selection technique.
2. By ignoring it. If prediction of ‘y’ values is the object of our study, then collinearity isn’t a problem

ANSWER 3

The correlation threshold value is +1 for highly collinear variables as the value of correlation varies from -1 to +1, and for extreme positive value of correlation, i.e +1, the collinearity is the highest.

ANSWER 4

The two different types of variables used in ANOVA (Analysis Of Variance) statistical technique are:

1. Categorical variable
2. Numerical variable

ANSWER 5

In the Chi-Square test, the null hypothesis is that the two categorical variables taken for consideration in this statistical technique are independent in a single population. The alternate hypothesis is that there is some relationship between the two categorical variables and hence are mutually dependent on each other.