Answer three questions taking at least 1 (one) from each group. Figures in the right indicate full marks.

Group A

1. **Call duration of 6 calls in a customer care center are**

$$2, 2.5, 1.5, 5, 6, 3$$

  (a) What is a sample?   1

  (b) Are all quantitative variables continuous?   2

  (c) Determine $\sum_{i=1}^{7}(x_i - 3)^3$ 3

  (d) Find the values of $\sum_{i=1}^{7}(x_i - 5)^2$ and $\sum_{i=1}^{7} x_i^2 + 5$.   4
      Explain mathematically why they are unequal.

2. **Scores of a batsman in the last 20 innings are**

$$28, 30, 16, 48, 50, 86, 105, 20, 10, 36,$$
$$12, 25, 20, 35, 65, 12, 10, 76, 55, 32$$

  (a) Write down the formula of weighted harmonic mean   1

  (b) Can median be a better measure of central tendency than arithmetic mean for this data?   2

  (c) Draw a stem and leaf plot from the data and explain.   3

  (d) Make a frequency distribution from the data and also find and interpret cumulative frequencies and percentages.   4

3. **Frequency distribution of marks in statistics of a college is given in the following table.**

Marks	Number of Students Group - A	Number of Students Group - B
25-30	11	10
30-35	18	16
35-40	21	22
40-45	26	28
45-50	14	9

  (a) What is data   1

  (b) What are the disadvantages of secondary data?   2

  (c) Calculate the arithmetic mean of Group - A   3

  (d) Compute the combined mean. Is it greather than the arithmetic mean of Group - B? Explain the possible reason(s).   4

4. **In the test examination, marks of 10 students in statistics are**

$$69, 85, 77, 66, 92, 42, 97, 53, 83, 81.$$

  (a) What is central tendency?   1

  (b) When is median better than arithmetic mean? Explain with an example.   2

  (c) Find the and 63rd percentile from the data and explain.   3

  (d) Below which mark lie marks of 70% students? Find using two separate quantiles.   4

Group B

5. **Marks obtained by a student in 7 subjects are**

$$70, 66, 55, 45, 80, 30, 82$$

   (a) What is negative skewness?   1

   (b) Draw graphs of positive and negative skewness showing the locations of mean and median.   2

   (c) Determine the five number summary from the stem and explain.   3

   (d) Are the data symmetric? If not, comment on the pattern of data.   4

6. **Income of a freelancer in 6 successive months (from Jan to Jun) was found to be 46.0, 49.5, 51.5, 50.6, 56.5, and 60 (in thousands BDT.).**

   (a) What is time series data?   1

   (b) What are the components of a time series model?   2

   (c) Determine the 3-monthly moving average from the data.   3

   (d) Draw the moving averages on a graph paper and interpret.   4

7. **In a distribution, $\bar{X} = 70, Me = 75, Q_1 = 40, Q_3 = 63, \sigma = 2$, and $\mu_3 = 5.77$.**

   (a) What is skewness?   1

   (b) Can the second central moments be negative?   2

   (c) Find the skewness with Bowley's formula from the data and explain.   3

   (d) Estimate the skewness using the method of moment. Does it comply with Bowley's estimate?   4

8. **Annual sales of company are as given in the following**

Year	2010	2011	2012	2013	2014	2015	2016
Profit (million)	40	45	46	53	65	70	73

   (a) What is a trend?   1

   (b) Do the data in the stem seem to have a trend?   2

   (c) Find the trend using semi-average method.   3

   (d) Find the trend using 2-yearly moving average method. Would it better if we used 3-yearly method?   4