N:B: Read the questions carefully and answer the associated questions correctly. Answer any FIVE questions. Figures in the right indicate full marks.

1. **An analyst obtains some data:**

$$x_1 = 15, x_2 = -12, x_3 = 17, x_4 = 11, x_5 = 23$$

   (a) What is sample?   1

   (b) Briefly explain shift or origin and scale.   2

   (c) Compute the value of $\sum_{i=1}^{5}(x_i - 10)^2$ 3

   (d) Find the value of $\sum_{i=1}^{5}(5x_i^2 - 4x_i - 3)$ and examine its dependency on origin and scale.   4

2. **A departmental store records their sales. An analysis of products with prices less than tk. 30 generates the following table.**

Price	0-5	5-10	10-15	15-20	20-25	25-30
Frequency	1	0	2	3	8	12

   (a) What is relative frequency?   1

   (b) If $Y = a + bX$, $\bar{Y} =$?   2

   (c) Find 67th Percentile and 3rd Quartile and explain.   3

   (d) Is AM or Median more suitable for this data? Elucidate.   4

3. **A cyclist moves around a square-shaped lake with the speeds 20, 25, 30, and 16 km per hour.**

   (a) What is grouped data?   1

   (b) Is arithmetic mean suitable for this data?   2

   (c) Find the average speed of the cyclist.   3

   (d) Can we use some other formula for finding the average? Demonstrate.   4

4. **There has been an increase in average lifetime of people of Bangladesh. To get more insight on this, a research was conducted, in which ages of retired government employees were recorded. A sample of 10 people is given below:**

$$75, 62, 63, 72, 66, 76, 59, 77, 70, 79$$

   (a) What is the 2nd central moment?   1

   (b) Show that the first central moment is zero.   2

   (c) Find the variance of the data.   3

   (d) Are the data symmetric? Justify.   4

5. **The first four moments about 3 of a distribution are -1, 5, -10, and 120.**

   (a) What are moments used for?   1

   (b) Can the second central moment be greater than the third central moment?   2

   (c) Find the second and third moments about arithmetic mean of the distribution.   3

   (d) Find skewness and kurtosis and comment on the values.   4

6. **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