

[**N.B.** – The figures of the right margin indicate full marks. Read the stems carefully and answer the associated questions. Answer any **FIVE** questions taking at least two from each group.]

Group–A

1. The capital and profit (in million BDT) of some Bangladeshi industries are bgiven below:

Industry	1	2	3	4	5
Capital (X)	20	15	26	31	18
Profit (Y)	15	10	17	25	10

- (a) What is finite population?

1
- (b) What are the functions of statistics?

2
- (c) Find the value of  $\sum_{i=1}^5 \sum_{j=1}^5 (x_i - y_j)$

3
- (d) Analyze the statement theoretically and empirically:  $\sum_{i=1}^5 (4x_i - 6y_j) = 4 \sum_{i=1}^5 x_i - 6 \sum_{i=1}^5 y_j$

4
2. Marks obtained by five students in statisics out of 15 were 4, 6, 10, 12, and 15. The examiner said, the square of the sum of the marks is greater than the sum of the squares of the marks.
- (a) What is finite population?

1
- (b) Explain quantitative variable with an example.

2
- (c) In the light of the available data, find  $\sum_{i=1}^5 (x_i - 2x)^2$

3
- (d) Verify the comment of the examiner.

4
3. A passer-by walks 3 hours at 5 km per hour (kph), another 3 hours at 4 kph, and another 3 hours at 3 kph.
- (a) When is harmonic mean suitable?

1
- (b) Which mean could we use for the given data and why?

2
- (c) Find the average speed of the passer-by usingt he proper method.

3
- (d) Find the correct and suitable average speed using another method and mathematically show they are equivalent.

4
4. In the test examination, marks of 11 students in statistics are: 90, 92, 93, 49, 44, 88, 80, 58, 83, 71, 76.
- (a) What is central tendency?

1
- (b) When is median better than arithmetic mean? Explain with an example.

2
- (c) Find the 3rd the quartile and 61<sup>st</sup> percentile from the data and explain.

3
- (d) Do quantiles depend on change of origin and scale. Prove using two examples.

4

Group–B

5. 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
6. Bangladesh foreign debt has been increasing rapidly in recent years. The Bangladesh bank provides the follwoing data.

Fiscal Year	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Debt	41.17	45.81	56.01	62.63	68.55	81.62	95.45	98.94	~130.00

- (a) Name the components of time series.

1

- (b) What are linear and non-linear trends? 2
  - (c) Find 3-yearly moving average from the data and plot. 3
  - (d) Which components of time series may underlie the data? Analyze. 4
7. **Every country has one or more agencies to deal with statistics of the country for proper management of its assets and population. Bangladesh Bureau of Statistics (BBS) serves as the centralized official bureau in Bangladesh for collecting and disseminating statistics in Bangladesh. USA has several such agencies, like Census Bureau or Bureau of Labor Statistics.**
- (a) What is data? 1
  - (b) How is statistics important in planning? 2
  - (c) Differentiate between official and non-official statistics. 3
  - (d) Elucidate the classification of published statistics in Bangladesh. 4