

Statistics (Theory) Paper-A

Attempt **Five** questions in all. Selecting at least two questions from each section.
 Use of Calculator and Statistical Tables is allowed.

SECTION-I

- 1- a) If the first four moments of a set of numbers about 3 are equal to -2, 10, -25, 50.

Determine the corresponding moments i) about the mean ii) about zero. 10

- b) Compute the coefficient of rank correlation for the following ranks: 5

x	8	3	6.5	3	6.5	9	3	1	5
y	8	9	6.5	2.5	4	5	6.5	1	2.5

- 2- a) Prove that the general formula connecting the moments about mean with moments about origin is

$$\mu_r' = \mu_r' - r_{c_1} \mu_{r-1}' + r_{c_2} \mu_{r-2}' - \dots + (-1)^r (\mu_1')^r.$$
7

- b) Fit a curve of type $y = a e^{bx}$ to the following data: 8

x	1	2	3	4	5
y	27	73	200	545	1484

Also calculate trend value of y for x = 6, 7.

- 3- a) Define time series and its components in detail. 5

- b) Compute the seasonal indices for the four quarters by the ratio-to-moving average method from the following data: 10

Year	Quarter			
	I	II	III	IV
1961	122	125	118	117
1962	119	114	114	109
1963	105	99	93	89
1964	86	80	83	84

Also deseasonalize the data for years 1962, 64.

- 4- a) If the regressional line X on Y is given by $\hat{X} = a + bY$, prove that the standard error of estimate is given by

$$S_{x,y} = \sqrt{\frac{\sum x^2 - a \sum x - b \sum xy}{n - 2}}$$
6

- b) Construct the following number of prices for 1950 and 1951 from the given data:

- i) Base year weighted ii) Current year weighted 9

Commodity	Prices			Quantities		
	1946	1950	1951	1946	1950	1951
A	70.50	80.65	85.00	270	276	290
B	146.95	155.00	154.75	24	18	44
C	25.50	32.50	30.50	130	121	137
D	64.75	75.00	60.95	185	267	355

- 5- a) Define an Index Number. Discuss the main steps involved in the preparation of an index number. 7

- b) Calculate the coefficient of correlation by first multiplying each x and each y and then subtracting 70 from each x and 60 from each y: 8

x	8.2	9.6	7.0	9.4	10.9	7.1	9.0	6.6	8.4	10.5
y	8.7	9.6	6.9	8.5	11.3	7.6	9.2	6.3	8.4	12.4

SECTION-II

- 6- a) Describe the classical, relative frequency and subjective concept of probability. 6

- b) Three urns of the same appearance have the following proportions of white and black balls 9

urn A	urn B	urn C
1 white, 2 black balls	2 white, 1 black ball	2 white, 2 black balls

One of the urn is selected and a ball is drawn from it. It turns out to be white. What is the probability that urn B was chosen.

7- a) From the following joint probability distribution of x and y. Find $\text{var}(x)$, $\text{var}(y)$, $\text{cov}(x, y)$.

7

X \ Y	0	1	2	3
0	.05	.05	0.10	0
1	.05	0.10	0.25	0.10
2	0	0.15	0.10	0.15

b) Determine the probability distribution for the number of white beads among 5 beads drawn at random from a bowl containing 4 white and 7 black beads. Use this to compute the mean and variance.

8

8- a) Derive Poisson distribution as a limiting form of the binomial distribution.

7

b) In testing a certain kind of truck tire over a rugged terrain, it is found that 60% of the trucks fails to complete with a blowout of the next 6 trucks tested, Find the probability that:

8

- i) from 2 to 4 have blowout. ii) fewer than 3 have blowout. iii) more than 4 have blowout.

9- a) Prove that the normal curve has points of inflection which are equidistant from the mean.

6

b) Services calls come to a maintenance centre according to a Poisson process, and on the average 30 calls come per minute. Find the probability that:

9

- i) no more than 4 calls come in any minute ii) fewer than 2 calls come in 3 minute period.
iii) more than 3 calls come in a 5 minute period.

10- a) The finished inside diameter of a piston ring is normally distributed with a mean of 10 centimeters and a standard deviation of 0.03 centimeter.

6

- i) What proportions of rings will have inside diameter exceeding 10.075 centimeters?
ii) What is the probability that a piston ring will have an inside diameter between 9.97 and 10.03 centimeter.
iii) Below what value of inside diameter will have 15% of the piston rings fall?

b) The continuous random variable x has the probability density function

9

$$f(x) = \frac{3}{4} (1 + x^2) \quad 0 \leq x \leq 1$$

$$= 0 \quad \text{else where}$$

$$\text{If } E(x) = \mu \text{ and } \text{var}(x) = \sigma^2 \text{ Find } P(1x - \mu | < \sigma).$$

*** B.A/B.Sc – I (18/A) xi ***