

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 6521

J

Unique Paper Code : 2922101203

Name of the Paper : Statistics for Business Economics – I

Name of the Course : **B.A. (Hons.) Business Economics (2025)**

Semester : II

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **all** questions.
3. Choice is available within each question.
4. Use of simple calculator is allowed.
5. Required statistical tables are attached with this paper.

1. Attempt **any three** the following : (3×10=30)

- (a) The Land holding data of 325 farmers surveyed in a district in India has the following distribution :

Land holding (ha)	0 - <2	2 - <4	4 - <10	10 - <20	20 - <30	30 - <42
No. of farmers	82	124	71	20	15	12

- (i) Construct a histogram corresponding to this frequency distribution and comment on the shape of the distribution.

P.T.O.

- (ii) What proportions of farmers have land holdings less than 24 ha?
Between 16 to 34 ha?

- (b) Given the following data :

15.0 13.0 18.0 14.5 12.0 11.0 8.9 8.0 6.5 14.0 9.5 8.5 7.5 13.5

Determine the values of the sample mean, sample median, and 12.5% trimmed mean, and compare these values.

- (c) The given data consists of marks obtained by the students of JLN University in Physics in Semester I.

211 408 171 178 359 249 205 203 201 223 234 256 218

- (i) Construct a boxplot for the given data and comment on its features.
- (ii) How large or small does an observation have to be to qualify as an outlier? Are there any outliers in the sample? Any extreme outliers?
- (d) (i) From a moderately skewed distribution of retail prices for men's shirts, it is found that the mean price is Rs. 250 and the median price is Rs. 190. If the coefficient of variation is 30%, find the Pearsonian coefficient of skewness of the distribution.
- (ii) Weekly average wages of workers in a factory increase from Rs. 800 to Rs. 1200 and standard deviation increases from Rs. 100 to Rs. 500. Comment on the resulting wage structure.

2. Attempt **any four** of the following :

(4×10=40)

- (a) (i) Disks of polycarbonate plastic from a supplier are analyzed for scratch and shock resistance. The results from 100 disks are summarized below :

		Shock resistance	
		High	Low
Scratch resistance	High	70	9
	Low	16	5

Let A denote the event that a disk has high shock resistance, and let B denote the event that a disk has high scratch resistance. If a disk is selected at random, calculate :

Find: (i) $P(A/B)$ (ii) $P(B/A)$ (iii) $P(A \cup B)$ (iv) $P(A')$

- (ii) A company produces light bulbs at three factories A, B, C. Factory A produces 40 percent of the total number of bulbs, of which 2 percent are defective. Factory B produces 35 percent of the total number of bulbs, of which 4 percent are defective. Factory C produces 25 percent of the total number of bulbs, of which 3 percent are defective. If a defective bulb is found among the total output, find the probability that it came from: (a) factory A, (b) factory B.

- (b) (i) The random variable X has the following probability distribution :

x	2	3	5	8
P(x)	0.2	0.4	0.3	0.1

Calculate

- (i) $E(X)$ (ii) $V(X)$ (iii) $E(2X-7)$ (iv) $V(2X-7)$

P.T.O.

- (ii) The tensile strength of paper is modeled by a normal distribution with a mean of 35 pounds per square inch and a standard deviation of 2 pounds per square inch.
- (a) What is the probability that the strength of a sample is less than 40 lb/in²?
- (b) If the specifications require the tensile strength to exceed 30 lb/in², what proportion of the samples is scrapped?
- (c) (i) The shelf life (in hours) of a certain perishable packaged food is a random variable whose probability density function is given by

$$f(x) = \begin{cases} \frac{K}{(x + 100)^3}, & x \geq 0 \\ 0, & \text{otherwise} \end{cases}$$

- (a) Calculate the value of K.
- (b) Find the probability that the packaged food will have a shelf life between 80 to 120 hours.
- (c) The number of requests for fire brigade service received follows a Poisson process with rate of 4 per hour. Compute the probability that exactly five requests are received during a particular 2-hour period. What is the probability that no requests in a 15 minutes period.

- (d) (i) Let X be a random variable with the following distribution function :

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{3}x + \frac{2}{3} & 0 \leq x < 1 \\ \frac{2}{3} & 1 \leq x < 2 \\ 1 & x \geq 2 \end{cases}$$

Calculate:

(a) $P(X < 1/2)$.

(b) $P(X < 3/2)$.

(c) $P(1/2 < X < 2)$.

(d) $P(X = 1)$.

- (ii) Suppose that the joint probability function of X and Y is as specified in the following table :

	Y				
X	0	1	2	3	4
0	0.08	0.07	0.06	0.01	0.01
1	0.06	0.1	0.12	0.05	0.02
2	0.05	0.06	0.09	0.04	0.03
3	0.02	0.03	0.03	0.03	0.04

Determine each of the following probabilities :

(i) $P(X = 2)$ (ii) $P(X < 2 \text{ and } Y < 2)$ (iii) $P(X = Y)$

- (e) Suppose that X and Y have a continuous joint distribution for which the joint probability density function defined as follows :

$$f(x, y) = \begin{cases} \frac{3}{2}y^2 & 0 \leq x \leq 2, 0 \leq y \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

(i) Determine the marginal densities of X and Y.

(ii) Are X and Y independent?

3. Attempt **any two** of the following : (2×5=10)

- (a) (i) State three properties of coefficient of correlation.
- (ii) The correlation coefficient between two variables X and Y is found to be 0.5. What is the correlation between 3X and (−Y)?
- (b) The rank correlation of MBA students in participating in 'Bazar' game involving 11 participants was calculated as 0.6. However, it was later discovered that the difference in ranks of a participant was read as 8 instead of 3. Find the correct value of rank correlation.
- (c) Calculate the Karl Pearson's coefficient of correlation in the following series related to cost of living and wages :

Wages	100	101	103	102	100	99	97
Cost of living	98	99	99	97	95	92	95

4. Attempt **any two** of the following : (2×5=10)

- (a) (i) Assume that an index number is 100 in 2013-14, it rises 4% in 2014-15, falls 1% in 2015-16, rises 3% in 2016-17 and rises 4% again in 2017-18. The rise and fall begin with respect to the previous year. Calculate the index of the 5 years using 2017-18 as the base year.

- (ii) A worker earned Rs.900 per month in 2020. The cost of living index has increased by 70% between 2020 and 2023. How much extra annual income should the worker earn in 2023 so that he could the same level of quantities as in 2020? What should be nominal annual salary in 2023 if worker is given a 10% increment is given on the real salary?
- (b) (i) In the data given below, 2013 is the year of discontinuation of the old series. Construct a continuous series by Splicing.
- (a) Old series and (b) New series.

Year	Index (old series)	Index (new series)
2010	98	
2011	100	
2012	104	
2013	110	100
2014		106
2015		108
2016		114

- (ii) Compute the Fisher price index number from the following information taking 2022 as the base :

Commodity	2022		2024	
	Price	Qty.	Price	Qty.
A	2	74	3	82
B	5	125	4	140
C	7	40	6	33