Total No. of Printed Pages—11

HS/XII/A. Sc./S/25

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STATISTICS

Full Marks : 100

Time : 3 hours

The figures in the margin indicate full marks for the questions

General Instructions :

(i) Write all the answers in the Answer Script.

(ii) Attempt Part—A (Objective Questions) serially.

(iii) Attempt all parts of a question together at one place.

(PART : A—OBJECTIVE)

(*Marks* : 50)

SECTION—I

(*Marks* : 20)

1. Choose and write the correct answer : 1×10=10

(a) The mean of a binomial distribution is

(i) n

(ii) np

(iii) npq

(iv) None of the above

(b) The skewness of the normal distribution is

(i) 1 (one)

(ii) (infinity)

(iii) 1 (negative one)

(iv) 0 (zero)

(c) The price index number for the current year compared to the base year is denoted by

(i) Q_{10}

(ii) P_{10}

(iii) P_{01}

(iv) Q_{01}

(d) The probability of a specified unit being included in the sample is equal to

(i) N

(ii) n

(iii) $\frac{n}{N}$

(iv) $\frac{N}{n}$

(e) The additive model for time series analysis is

(i) $Y \quad T \quad S$

(ii) $Y \quad C \quad S$

(iii) $Y \quad T \quad S \quad C \quad 1$

(iv) $Y \quad T \quad S \quad C \quad I$

(f) The time reversal test may be expressed as

(i) $P_{01} \quad 1$

(ii) $P_{01} \quad P_{10} \quad 1$

(iii) $P_{01} \quad P_{10} \quad 0$

(iv) $P_{10} \quad 1$

(g) A die is thrown. Let X denote the point on the uppermost face. Then $E(X)$ is

(i) 1

(ii) 21

(iii) $\frac{1}{6}$

(iv) $\frac{7}{2}$

(h) The mean and variance of a Poisson distribution are

(i) (0, 0)

(ii) (0,)

(iii) (,)

(iv) (, 0)

(i) If ^{2} is the population variance, then which of the following is correct in case of SRSWR?

(i) var $(\bar{x})$ $\frac{^2}{n}$

(ii) var $(\bar{x})$ $\frac{^2}{n}$

(iii) var $(\bar{x})$ $\frac{^2}{n}$

(iv) var $(\bar{x})$ $\frac{^2}{n}$

(j) The error which arises only in sample survey is termed as

(i) sampling error

(ii) non-sampling error

(iii) Both *(i)* and *(ii)*

(iv) Neither *(i)* nor *(ii)*

2. Fill in the blanks : 1×5=5

(a) If X and Y be two _____ variables, then $E(XY)$ $E(X)$ $E(Y)$.

(b) If the standard deviation of a Poisson variate is 2, the mean of the Poisson variate is _____.

(c) _____ index is known as 'ideal' formula for constructing index number.

(d) A sample is a study of _____ of the population.

(e) An overall tendency of rise or fall in a time series is called _____.

3. Write whether the following statements are *True* or *False* : 1×5=5

(a) An era of prosperity is a cyclical component of time series.

(b) Census is superior than sample survey.

(c) Paasche's index formula does satisfy factor reversal test.

(d) The mean and standard deviation of standard normal variate are respectively 0 and 1.

(e) If X is a random variable and c is a constant, then $E(cX)$ $cE(X)$.

SECTION—II

(*Marks* : 30)

4. Answer the following questions : 3×10=30

(a) If a random variable X takes the values 1, 2, 3 with probability

$$P(X \quad r) \quad \frac{r}{6}; r \quad 1, 2, 3$$

find $E(X)$. 3

(b) The random variable X follows binomial distribution with mean 6 and variance 4. Find the probability distribution of X. 3

(c) State the important properties of normal distribution. 3

(d) Write down the formula for the following index numbers : 1×3=3

(i) Laspeyres' price index number

(ii) Paasche's price index number

(iii) Value index number

(e) Mention three uses of index numbers. 1+1+1=3

(f) Which component of time series is mainly applicable in the following cases? 1×3=3

(i) Fire in a factory

(ii) Recession

(iii) An increase in employment of labour during harvest time

(g) Enumerate the objective of analysis of time series. 3

(h) A simple random sample of 10 households was drawn from a town of 1200 households. The numbers of persons in the selected houses were :

2, 2, 3, 3, 4, 5, 6, 3, 3, 4

Estimate the number of persons in the town. 3

(i) Discuss briefly the basic principles of a sample survey. 3

(j) Explain clearly the following with suitable examples : 1×3=3

(i) Population

(ii) Sample

(iii) Sampling frame

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

Answer **four** questions, taking at least **one** from each Group

GROUP—A

5. *(a)* Define a discrete random variable. Give one example. 2

(b) A random variable X has the following distribution :

X	0	1	2	3	4	5
$P(X)$	0·1	0·2	0·3	0·1	—	0·1

Find $P(4)$ and $E(X)$. 1+3=4

(c) Write down three properties of expectation. ½+½+½=1½

(d) Find the mean and variance of binomial distribution. 5

6. *(a)* If X follows normal distribution with mean 66 and standard deviation 5, find—

(i) $P(65 \quad X \quad 70)$;

(ii) $P(X \quad 72)$.

Given that

$P(Z \quad 0\ 8) \quad 0\ 7881$ and $P(Z \quad 0\ 2) \quad 0\ 5793$ 5

(b) If X has a Poisson distribution and $P(X \quad 0) \quad \frac{1}{2}$, what is $E(X)$? 2½

(c) The random variable X has the p.m.f.

$X \quad x$	0	1	2	3
$p(x)$	$\frac{1}{3}$	$\frac{1}{2}$	$\frac{1}{24}$	$\frac{1}{8}$

Find the expected value of $Y \quad (X \quad 1)^2$. 5

GROUP—B

7. *(a)* Define time series. What are its components? Explain any one of them. 2+2+2=6

(b) Using least squares of method, find the trend values from the following data : 5

Year	1990	1991	1992	1993	1994	1995	1996
Production	83	60	54	21	22	13	23

(c) Define moving average method. 1½

8. *(a)* Explain briefly the method of computing index number—

(i) by weighted aggregative method;

(ii) by simple aggregative method;

(iii) by simple average of price relative method. 2×3=6

(b) Construct price index numbers from the following data, using—

(i) Laspeyres' and

(ii) Marshall-Edgeworth : 2+3=5

Commodity	*1990*		*1993*	
	Price	*Quantity*	*Price*	*Quantity*
A	6	50	10	56
B	2	100	2	120
C	4	60	6	60
D	10	30	12	24

(c) Why is Fisher's index number formula called an ideal index number formula? 1½

GROUP—C

9. *(a)* What is a simple random sample? Mention the various methods of drawing a random sample. 1½+3=4½

(b) Define simple random sampling with and without replacement. 3

(c) Prove that in simple random sampling without replacement, sample mean is an unbiased estimate of population mean. 5

10. *(a)* What are the errors in a sample survey? Show how non-sampling errors differ from sampling errors. 1+3=4

(b) What do you mean by stratified random sampling? Describe how you will draw a stratified random sample. Write down the formulae for estimating the population total and population mean by a stratified sample. 2+3+2=7

(c) What is the total number of samples, when sampling is done without replacement from a population of size N? 1½

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