Total No. of Printed Pages—11

HS/XII/A. Sc/S/18

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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) If n 25, p $\frac{2}{5}$ and q $\frac{3}{5}$, then the standard deviation of the binomial distribution is

(i) 6

(ii) $\sqrt{6}$

(iii) 5

(iv) $\sqrt{10}$

(b) The equality of mean and variance of a discrete distribution indicates that the distribution is

(i) Poisson

(ii) binomial

(iii) normal

(iv) hypergeometric

(c) If $E(2X \quad 3) \quad 27$, then the value of $E(X)$ is

(i) 12

(ii) $\frac{9}{2}$

(iii) 5

(iv) 7

(d) The mean of a binomial distribution is 27 and $q \quad \frac{1}{3}$, then the variance is

(i) 81

(ii) 3

(iii) 9

(iv) $\frac{80}{3}$

(e) In a given business venture, a man can make a profit of ₹ 1,000 with probability 0·8 or take a loss of ₹ 400 with probability 0·2, then the expectation is

(i) ₹ 270

(ii) ₹ 720

(iii) ₹ 40,000

(iv) None of the above

(f) The price indices Laspeyres', Paasche's and Fisher's are related by which of the following inequalities?

(i) Laspeyres Fisher Paasche

(ii) Laspeyres Fisher Paasche

(iii) Fisher Laspeyres Paasche

(iv) Paasche Laspeyres Fisher

(g) A binomial distribution is

(i) uniparametric

(ii) biparametric

(iii) triparametric

(iv) None of the above

(h) Changes that take place as a result of natural calamities are classified under the head

(i) secular movement

(ii) seasonal variations

(iii) cyclical variations

(iv) irregular variations

(i) Which of the following is not a method for measuring trend?

(i) Graphic method

(ii) Moving-average method

(iii) Harmonic-analysis method

(iv) Least-squares method

(j) The most important factor(s) causing seasonal variations is/are

(i) growth of population

(ii) depression in business

(iii) weather and social customs

(iv) None of the above

2. Fill in the blanks : 1×5=5

(a) The term 'parameter' is used to denote the characteristic of the _____.

(b) If be the expected value of x, then $E(x$) _____.

(c) Fisher's index number is called _____ index number.

(d) Normal distribution is a _____ theoretical distribution.

(e) _____ is the difference between the parameter and its estimate obtained from the random sample.

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

(a) In sampling distribution, a finite population of 8 units, samples of size 4 can be selected in 50 ways.

(b) In a binomial distribution, mean variance.

(c) Trend can be measured by moving average method.

(d) Paasche's price index is the geometric mean of Laspeyre's and Fisher's price indices.

(e) In time-series analysis, the free-hand method can represent both linear and nonlinear trends.

SECTION—II

(*Marks* : 30)

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

(a) A pair of dice is thrown 200 times. If getting a sum of 9 is considered a success, find the mean and variance of the number of successes.

(b) Find the variance of the random variable X, where the probability distribution is given by the table :

X :	0	1	2	3
$P(X)$:	0·15	0·40	0·25	0·20

(c) If X and Y are independent random variables, then show that $E[\{X \quad E(X)\}\{Y \quad E(Y)\}] \quad 0$.

(d) State some of the important factors responsible for non-sampling errors in any survey (census or sample).

(e) What are the limitations of index number?

(f) Find the mean of the Poisson distribution.

(g) If X denotes the number of heads appear when two coins are tossed, then by using the laws of expectations, evaluate $E(2X \quad 1)^2$.

(h) Distinguish between seasonal variation and cyclical variation.

(i) Define cost of living index number. State its uses.

(j) Describe the models of a time series.

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

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

GROUP—A

5. *(a)* Define the following : 1½×3=4½

(i) Mathematical expectation

(ii) Discrete random variable

(iii) Continuous random variable

(b) Show that $E(aX)$ $aE(X)$. 3

(c) If the sum of the mean and variance of a binomial distribution for 5 trials is 1·8, then find the distribution. 5

6. *(a)* Define Poisson distribution and binomial distribution. Mention three conditions under which binomial distribution tends to Poisson distribution. 1½+1½+3=6

(b) Suppose 8% of the people are left-handed. What is the probability that 2 or more of a random sample of 25 are left-handed? [Given, e^{2} 0 135] 2½

(c) If three persons on an average come to *ABC* company for job interview, then find the probability that less than three people have come for interview on a given day. [Given, e^{3} 0 0497] 4

GROUP—B

7. *(a)* What are index numbers? Explain their uses. 2+3=5

(b) Write a short note on the method of selection of base period in the construction of an index number. 2½

(c) From the following table, construct the formulas of—

(i) Laspeyre's index;

(ii) Paasche's index. 2½×2=5

Item	*2012*		*2017*	
	Price p_{0i}	*Quantity* q_{0i}	*Price* p_{1i}	*Quantity* q_{1i}
A	4	20	6	10
B	3	15	5	20
C	2	25	3	15
D	5	10	4	40

8. *(a)* What are different types of index number? 2

(b) From the data given below, construct the cost of living index number : 4

Group	*Index number*	*Weights*
Food	250	45
Rent	150	15
Clothing	320	20
Fuel and lighting	190	5
Miscellaneous	300	15

(c) Explain various methods of measuring trend and point out their relative merits and demerits. 6½

GROUP—C

9. *(a)* Enumerate and explain various stages of a sample survey. 6½

(b) Show that

$$V(\bar{x})\ \text{SRSWOR} \quad \frac{2}{n} \quad \frac{N \quad n}{N}$$

where $\bar{x}$ and have usual meanings. 6

10. *(a)* Suppose 4 units of a population are X_1 2, X_2 4, X_3 6 and X_4 8. Draw all possible samples of size 2 without replacement and calculate their mean. Show that $E(\overline{X})$. Also find the variance of the estimate of the population mean in case of—

(i) SRSWR of size 2;

(ii) SRSWOR of size 2. 2+3½+3=8½

(b) Write a note on stratified random sampling. 4

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