HS/XII/A. Sc/S/22

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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 (any *ten*) :   1×10=10

   (a) The variance of the binomial distribution is

      (i) np

     (ii) npq

    (iii) $\sqrt{npq}$

    (iv) nq

                                                  [P.T.O.

(b) In sampling distribution, a finite population of 12 units, samples of size 7 can be selected in

  (i) 792 ways

  (ii) 868 ways

  (iii) 84 ways

  (iv) 704 ways

(c) The expectation of the number of heads in 15 tosses of a coin is

  (i) 7·5

  (ii) 15

  (iii) 3·75

  (iv) None of the above

(d) If the mean of a binomial distribution having $n = 8$ is 4, then the value of P is

  (i) 32

  (ii) 1/3

  (iii) 1/2

  (iv) 16

(e) If X is a random variable and $E(X) = \dfrac{1}{2}$, then the value of $E(7X + 2)$ is

  (i) 11/2

  (ii) 2/11

  (iii) 14/2

  (iv) 9/2

[Contd.

(3)

(f) If $Z = 2 + 3X + 5Y$ and $E(X) = 1, E(Y) = 2$, then the value of $E(Z)$ is

   (i) 10

   (ii) 15

   (iii) 13

   (iv) 12

(g) In an index number formula, the time reversal test is

   (i) $P_{01} \times P_{10} = 1$

   (ii) $P_{01} \times P_{10} = 0$

   (iii) $P_{01} + P_{10} = 1$

   (iv) None of the above

(h) Time series consists of

   (i) one component

   (ii) two components

   (iii) three components

   (iv) four components

(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 square method

(4)

(j) Which of the following is not a method for random sampling?

  (i) Simple random sampling

  (ii) Stratified sampling

  (iii) Systematic sampling

  (iv) Cluster sampling

(k) Any statistical measure computed from sample data is known as

  (i) parameter

  (ii) statistic

  (iii) census

  (iv) None of the above

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

  (i) secular movements

  (ii) seasonal variations

  (iii) cyclical variations

  (iv) irregular variations

2. Fill in the blanks (any *five*) :   1×5=5

(a) If X is a random variable and a is constant, then $V(aX) =$ _____.

(b) The sum of probabilities in a Poisson distribution is _____.

(c) Simple random sampling is not suitable if the population is _____.

(d) The expected value of a constant is the _____ itself.

(e) If X is a random variable and $E(X) = a, E(Y) = b$, then the value of $E(aX + bY) =$ _____.

(f) For a binomial distribution with $P = \dfrac{1}{4}$ and $n = 10$, the value of mean = _____.

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

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

(a) In normal distribution, mean < median < mode.

(b) Fisher's index number does not satisfy 'factor reversal test'.

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

(d) A time series is affected by economic factors alone.

(e) The number of parameters of a binomial distribution is one.

(f) Index numbers are called barometers of economic change.

[P.T.O.

SECTION—II

(*Marks* : 30)

4. Answer the following questions (any *ten*) : 3×10=30

(a) In a binomial distribution, prove that mean > variance.

(b) A die is thrown at random. What is the expectation of number on it?

(c) If a random variable X follows Poisson distribution such that $P(X = 1) = P(X = 2)$, find the mean of the distribution.

(d) Write any three uses of cost of living index number.

(e) Enumerate the objective of analysis of time series.

(f) Write any three advantages of sample survey over census.

(g) What do you understand by seasonal variations in time series? Explain with two examples.

(h) Write down the properties of normal distribution.

(i) Explain briefly how Fisher's ideal index number is constructed. Justify its being called 'ideal'.

(j) Obtain the binomial distribution whose mean is 10 and standard deviation is $2\sqrt{2}$.

(k) Name the components of a time series.

(l) If X and Y are independent random variables, then show that
$$E[\{X - E(X)\}\,\{Y - E(Y)\}] = 0$$

(7)

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

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

GROUP—A

5. *(a)* Find the mean and variance of a Poisson distribution. 4

(b) *(i)* Define random variable and probability distribution. 1+1=2

(ii) A coin is tossed 7 times. What is the probability that head appears an odd number of times? 3½

(c) The mean and variance of a binomial distribution are 4 and $\dfrac{4}{3}$. Find $P(X \geq 1)$. 3

6. *(a)* In binomial distribution, prove that

$$p(X = x+1) = \frac{n-x}{x+1} \cdot \frac{p}{q} \cdot P(X = x)$$

5

(b) The mean of a binomial distribution is 20 and the standard deviation is 4. Calculate *n, p* and *q*. 3

(c) Write the characteristics of Poisson distribution. 4½

GROUP—B

7. *(a)* The following table gives the group index numbers and the weights of different heads of expenditure in

the calculations of a cost of living index except, the index for the group fuel and lighting :

Group	Index	Weight
Food	221	35
Clothing	198	14
Fuel and lighting	?	15
Rent	183	8
Miscellaneous	161	20

If the cost of living index is 193, find the index number of fuel and lighting group. 5½

(b) Define a time series. What are its components? Explain any one of them. 2+2+3=7

8. *(a)* Discuss the differences between seasonal and cyclical variations. 6½

(b) What are the different types of index numbers? Discuss the main steps followed in the construction of cost of living index number. 6

GROUP—C

9. *(a)* In SRSWOR, show that $E(\bar{x}) = \bar{X}$, i.e., the sample mean is an unbiased estimator of population, where $\bar{x}$ and $\bar{X}$ have usual meanings. 6½

(b) Write short notes on the following : 2×3=6

 (i) Random sampling

 (ii) Stratified random sampling

 (iii) Sampling error

10. *(a)* Write a note on the difference between census and sample survey. 6

(b) What is sampling? Give its objects and name the laws which form the basis of sampling. 6½

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