Total No. of Printed Pages—11

HS/XII/A. Sc/S/13

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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 $E(X)$ 7 / 3, then the value of $E(3X$ 5) is

(i) 6

(ii) 5

(iii) 2

(iv) 12

(b) Write the odd man out in the following properties of expectation :

(i) $E(aX)$ $XE(a)$

(ii) $E(aX)$ $aE(X)$

(iii) $E(aX$ $b)$ $aE(X)$ b

(iv) $E(a)$ a

(c) If n 16 and p q $\frac{1}{2}$, then variance of binomial distribution is

(i) 2

(ii) 4

(iii) 8

(iv) 32

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

(i) binomial

(ii) Poisson

(iii) normal

(iv) hypergeometric

(e) A binomial distribution is

(i) uniparametric

(ii) biparametric

(iii) triparametric

(iv) None of the above

(f) Fisher's ideal index is

(i) the median of Laspeyres's and Paasche's index

(ii) arithmetic mean of Laspeyres's and Paasche's index

(iii) geometric mean of Laspeyres's and Paasche's index

(iv) None of the above

(g) The best average in the construction of index numbers is

(i) median

(ii) geometric mean

(iii) arithmetic mean

(iv) mode

(h) Seasonal variations repeat during a period of

(i) one year

(ii) five years

(iii) seven years

(iv) None of the above

(i) Cyclic fluctuations are caused by

(i) strikes and lockouts

(ii) floods

(iii) wars

(iv) None of the above

(j) The most important factors causing seasonal variations are

(i) growth of populations

(ii) weather and social customs

(iii) depression in business

(iv) None of the above

2. Fill in the blanks : ½×10=5

(a) A time series consists of data arranged ——.

(b) The additive model of time series is expressed as ——.

(c) Index numbers are called —— of economic change.

(d) —— test is satisfied both by Fisher's and Kelly's formula.

(e) In sampling distribution, a finite population of 10 units, samples of size 5 can be selected in —— ways.

(f) If Y 2 5X and $E(X)$ 2, then $E(Y)$ ——.

(g) If X 7, then $2E(X)$ ——.

(h) Mean is equal to variance in a —— distribution.

(i) Binomial distribution is symmetrical if $p \quad q \quad$ ——.

(j) The term parameter used to denote the characteristic of the ——.

3. Write whether the following statements are *True* or *False* : ½×10=5

(a) The standard normal distribution is denoted by $N(0, 1)$.

(b) $E(X^2) \quad 2E(X)$

(c) $\sum_{r \ 0}^{n} {}^{n}C_r P^r (1 \quad P)^{n \ r} \quad 1$

(d) An index number is not a pure number.

(e) The trial is not independent.

(f) In SWR, the standard error vanishes when sample size is equal to population size.

(g) According to *G.* Simpson and F. Kafka, index numbers are today one of the most widely used statistical devices.

(h) Index numbers, the base period should always be normal.

(i) To study change in the price level for the group of people, cost of living index is prepared.

(j) An overall rise or fall in a time series is called the secular trend.

SECTION—II

(*Marks* : 30)

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

(a) If X and Y are independent random variables, show that

$$E[\{X \quad E(X)\}\{Y \quad E(Y)\}] \quad 0$$

(b) Bring out the fallacy, if any, in the following statement :

"The mean of a binomial distribution is 20 and its standard deviation is 6."

(c) Three coins, whose faces are marked 1 and 2 are tossed. What is the expected of total value of numbers on their faces?

(d) The random variable X has the following distribution :

X	:	-1	0	1
$P(X)$	:	0·5	0·3	0·2

Find the variance of X.

(e) Find the mean of the Poisson distribution.

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

(g) What are the problems in the construction of index number?

(h) What is the random variables?

(i) What are the components of time series?

(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)* What do you understand by 'the expectation of random variable'? Explain as clearly as you can. 2+2=4

(b) Two unbiased dice are thrown together at random. Find the expected value of the total number of points shown up. 3½

(c) *A* and *B* play for a prize of Rs 99. The prize is to be won by a player who first throws a '2', with one die. *A* first throws and if he fails *B* throws and if he fails *A* again throws, and so on. Find their respective expectations. 5

6. *(a)* Define Poisson distribution. If a random variable *X* follow Poisson distribution such that

$$P(X \quad 1) \quad P(X \quad 2)$$

find *(i)* the mean of the distribution and *(ii)* $P(X \quad 0)$. 2+2=4

(b) The probability of a bomb hitting a target is $\frac{1}{5}$. Two bombs are enough to destroy a bridge. If six bombs are aimed at the bridge, find the probability that the bridge is destroyed. 5½

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

GROUP—B

7. *(a)* What do you mean by the term 'family budget enquiry'? Why is it used in the construction of cost of living index number? 2½+4=6½

(b) What is time series? What is the need to analyse a time series? 3+3=6

8. *(a)* A textile worker in the city of Bombay earns Rs 350 per month. The cost of living index for a particular month is given as 136. Using the following data, find out the amounts he spent on house rent and clothing : 6

Group	*Expenditure*	*Group index*
Food	140	180
Clothing	?	150
House rent	?	100
Fuel and lighting	56	110
Miscellaneous	63	80

(b) Write a note on the method of selection of base period in the construction of an index number. Name four important index numbers. 2½+4=6½

GROUP—C

9. *(a)* Define 'simple random sampling' and 'stratified random sampling'. Describe merits and demerits of it. 3+3½=6½

(b) What are sampling and non-sampling errors? 6

10. *(a)* What is sampling? Give its objects and name the laws which form the basis of sampling. 2+2+2½=6½

(b) Explain the concept of standard error. Discuss the role of standard error in large sample theory. 3+3=6

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