2024

STATISTICS

Full Marks: 100

Pass Marks: 33

Time: Three hours

Attempt all Questions.

The figures in the right margin indicate full marks for the questions.

For Question Nos. 1 to 10 choose the correct answer and rewrite.

1. If ${}^nC_5 = {}^nC_7$, then the value of n is : 1

   (A) 10 (B) 12

   (C) 14 (D) 16

2. Which of the following is a measure of central tendency ? 1

   (A) Median (B) Standard deviation

   (C) Mean deviation (D) Quartile deviation

3. Geometric mean of two numbers $\frac{1}{16}$ and $\frac{4}{25}$ is : 1

   (A) $\frac{1}{100}$ (B) 100

   (C) $\frac{1}{10}$ (D) 10

4. The minimum value in the data is 8 and the range is 64, then maximum value of the data is : 1

(A) 56 (B) 36

(C) 18 (D) 72

5. A random variable x has mean 10 and standard deviation 2, then the varience of the variable $y = 3x - 4$ is : 1

(A) 12 (B) 36

(C) 8 (D) 32

6. The coveriance between x and y is 4 and standard deviation of x and y are 5 and 6. The regression coefficient of y on x is : 1

(A) $\frac{4}{25}$ (B) $\frac{4}{5}$

(C) $\frac{1}{9}$ (D) $\frac{2}{3}$

7. Let p_1 and p_0 be the prices of current and base years, q_1 and q_0 be the corresponding quantities. Given that

$\sum p_1q_1 = 100, \sum p_0q_1 = 80, \sum p_1q_0 = 90, \sum p_0q_0 = 60$, the value index number is : 1

(A) $\frac{500}{3}$ (B) 125

(C) $\frac{1000}{9}$ (D) $\frac{5}{3}$

8. If the trend line with 1975 as origin is $y = 20.6 + 1.68x$, the trend line with 1971 as origin is : 1

(A) $y = 20.6 + 6.72x$ (B) $y = 13.88 + 1.68x$

(C) $y = 34.61 + 1.68x$ (D) none of the above

9. A sample consists of : 1

(A) all units of the population
(B) 50 percent of the population
(C) 10 percent of the population
(D) any fraction of the population

10. If the size of the sample n is small as compared to population size N in Simple random sampling, then the value of finite population correction is : 1

(A) 0 (B) 0.5
(C) 1 (D) none of the above

11. Define the complement of a set. 1

12. How many straight lines can be formed by joining the vertices of a hexagon? 1

13. Draw the Venn diagram of $A \cap B$, where A and B are two joint sets. 1

14. If the correlation between X and Y is perfect and negative then the increase in X is in proportion to increase in Y. Rewrite the correct statement. 1

15. Draw the scatter diagram of no correlation between two varibles. 1

16. Define base period for calculation of index number. 1

17. The base period must be a period of abnormality. Rewrite the correct statement. 1

18. Find the chain index No. for 1984. Given that link relative of 1984 is 120 and chain index for 1983 is 110. 1

19. What is meant by error of estimate for fitting of straight line by the principle of least squares ? 1

20. State the additive model of time series data. 1

21. Find the middle term in the expansion of $\left(x+\frac{1}{x}\right)^6$ 2

22. Draw the shape of Leptokurtic and Platykurtic curve as compare to normal curve. 2

23. Define bivariate distribution and give one example. 2

24. What is the data usually constitute the raw material for the construction of index number ? From where the data should be collected. 2

25. Factor Reversal Test is written as $P_{01}^{\ F} = \left[\frac{\sum p_0 q_0}{\sum p_1 q_0} \times \frac{\sum p_0 q_1}{\sum p_1 q_1}\right]^{1/2}$,

$Q_{01}^{\ F} = \left[\frac{\sum q_0 p_0}{\sum q_1 p_0} \times \frac{\sum q_0 p_1}{\sum q_1 p_1}\right]^{1/2}$,

$P_{01}^{\ F} \times Q_{01}^{\ F} = \left[\frac{\sum p_0 q_0}{\sum p_1 q_0} \times \frac{\sum p_0 q_1}{\sum p_1 q_1}\right]^{1/2} \times \left[\frac{\sum q_0 p_0}{\sum q_1 p_0} \times \frac{\sum q_0 p_1}{\sum q_1 p_1}\right]^{1/2} = \frac{\sum p_0 q_0}{\sum p_1 q_1}$, where p_1, p_0 are current year and base year prices and q_1, q_0 are corresponding quantities. Rewrite the correct formula. 2

26. Given the data : 2

	Commodities	
	A	B
p_0	1	1
q_0	10	5
p_1	2	x
q_1	5	2

where p and q stands for price and quantity and subscripts 1 and 0 stand for current and base years. Find x, if Laspeyre's price index number is $\frac{800}{3}$.

27. Obtain the trend values by the method of semi-averages from the following data : 2

Year :	1971	1972	1973	1974	1975	1976
Bank clearance : (Rs. crores)	53	79	76	66	69	94

28. A sample of size 5 is drawn from the population of size 10 by simple random sampling without replacement. Find the probability of selecting any specified unit : 2

(i) of the population in any draw

(ii) included in the sample

29. If $A=\{1,2,3,5\}, B=\{2,4,5,6\}$

Prove that $(A-B)\cup(B-A)=(A\cup B)-(A\cap B)$ 4

Or

If $A=\{2,4,6\}, B=\{3,4,7\}, C=\{1,3,5\}$

Prove that $(A\cup B)-C=(A-C)\cup(B-C)$.

30. How many straight lines can be formed by 7 points such that no three points are collinear with the exception that 4 points are collinear ? 4

Or

A committee of 4 members is to be formed from 5 gentlemen and 2 ladies such that the committee consists of at least one lady. Find the number of different committees that can be formed.

31. What is meant by measure of central tendency ? Find the relation between arithmetic mean and geometric mean. 4

Or

Define rth moment about the mean and about any other point. Show that rth moment about the mean is independent of change of origin.

32. Calculate the average marks by step deviation method from the following data : 4

Marks :	0-10	10-20	20-30	30-40	40-50
No. of students :	42	44	53	35	26

Or

Calculate the quartile deviation from the following data :

Age in years :	20	30	40	50	60	70	80
No. of members :	3	61	100	145	132	47	3

33. Identify the two regression lines and sign of correlation coefficient from the two regression lines 4

$3x + 12y = 9$ and $3y + 9x = 46$

34. Prepare quantity index numbers by using Laspeyere's and Paasche's method from the following data : 4

Article	Year			
	2014		2015	
	p_0	q_0	p_1	q_1
A	5	5	6	6
B	7	6	9	10
C	9	4	10	6

35. The table below given the figures of production of a commodity in the state of Punjab.

Year (x) :	2001	2002	2003	2004	2005
Production (y) : (in 1000 tons)	10	12	8	10	14

Fit the straight line to the data by the method of least squares. Use the transformation u = x – 2003. 4

Or

Calculate the 4-yearly moving average from the following data :

Year :	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Value:	50.0	36.5	43.0	44.5	38.9	38.1	32.6	41.7	41.1	33.8

36. Show that of all rectangles of a given area, the square has the smallest perimeter. 6

Or

Find the maximum and minimum values of the function $x^3 - 9x^2 + 15x - 3$.

37. The runs scored by two batsmen A and B in 7 consecutive matches are given below. 6

A :	84	20	64	28	56	14	70
B :	72	12	28	35	64	20	49

Which of the batsman is more consistent ?

38. Calculate the correlation coefficient between the height of sisters and height of brothers from the given data : 6

Height of sisters (in cm) :	64	65	66	67	68	69	70
Height of brothers (in cm) :	66	67	65	66	70	68	72

Or

Estimate the value of x when y=10 from the regression line of x on y given that

x :	3	5	6	7	9
y :	2	3	4	6	8

39. Calculate the index number for food group from the following data : 6

Food items	Rice	Dal	Oil	Fish	Vegetables	Refreshment
Weight :	44	13	8	7	18	10
Percentage increase in price :	100	50	150	60	200	140

Also calculate the amount to be received in current year of Mr. X, if the amount received in the based year is Rs. 15,000. Given that

	Food	Clothing	Fuel & Light	Rent	Misc.
Group index :	-	250	200	150	200
Weight :	60	5	8	9	8

40. Explain secular trend and irregular movements of time series and state the uses of time series. 6

Or

Describe the method of moving averages for estimating the trend in a time series. Discuss its merits.

41. Construct a sampling distribution of the sample mean from the population when a simple random sampling of size 2 are taken from it with replacement. 6

Population unit :	1	2	3	4
Observations :	22	24	26	28

Or

Consider a population of 5 units with values 2, 4, 8, 6, 5. Write down all possible samples of size 2 without replacement from the population and verify that sample mean is an unbiased estimate of population mean.