

This Question Paper contains 11 printed pages

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Sl. No. :

135(E)
(February, 2025)

Time : 3 Hours]

[Maximum Marks : 100

Instructions :

- (1) This question paper contains 6 sections.
- (2) All questions are compulsory. Options are internal.
- (3) Use of Z-table and simple calculator is allowed.

SECTION - A

■ Choose the correct alternative from the following multiple choice type questions and write it. Each question carries 1 mark : [20]

- 1) Which prices are considered in the construction of the cost of living index number?
(A) Market price
(B) Wholesale price
(C) Average price
(D) Retail price
- 2) If the purchase power of money is 0.75 in the year 2024 with respect to the base year 2023 then what will be the price index number for the year 2024?
(A) 750
(B) 175
(C) 133.33
(D) 275

- 3) What is the range of the correlation coefficient r ?
- (A) $-1 < r < 1$
 (B) 0 to 1
(C) $-1 \leq r \leq 1$
 (D) -1 to 0
- 4) In the method of rank correlation, in usual notations if $R_x = R_y$ for each pair of observations then what is the value of the r ?
- (A) 0 (B) -1
(C) 1 (D) 0.1
- 5) The regression line always passes through which point?
- (A) (\bar{x}, \bar{y})
 (B) $(0, \bar{y})$
 (C) $(\bar{x}, 0)$
 (D) $(0, 0)$
- 6) What is coefficient of determination in the study of regression for two variables?
- (A) Product of two standard deviations
(B) Square of correlation coefficient
 (C) Square of covariance
 (D) Product of two variances
- 7) Which variation is shown in increase in the sale of umbrellas of a company due to monsoon?
- (A) RANDOM
 (B) Trend
(C) Seasonal
 (D) Cyclical
- 8) State the independent variable of time series.
- (A) y_t (B) S_t
(C) t (D) x_t

- 9) Which random experiment from the following random experiments has an infinite sample space?
- (A) Throwing two dice
(B) Selecting two employees from an office
(C) To measure the life of electric bulb
(D) Select a card from 52 cards
- 10) What is the probability of having 5 Mondays in the month of February in a year which is not a leap year?
- (A) 0 (B) $\frac{1}{7}$
(C) $\frac{2}{7}$ (D) $\frac{3}{7}$
- 11) Which variable of the following will be an illustration of continuous variable?
- (A) Number of accidents occurring at any place
(B) Number of rainy days during a year
(C) Maximum temperature during a day
(D) Number of children in a family
- 12) For the probability distribution of a discrete random variable X , $E(X) = 5$ and $E(X^2) = 35$, what will be the variance of this distribution?
- (A) 40 (B) 30
(C) 20 (D) 10
- 13) The binomial distribution has mean 6 and variance $\frac{12}{7}$. What will be the type of this distribution?
- (A) Positively skewed
(B) Negatively skewed
(C) Symmetric
(D) Nothing can be said about the distribution

- 14) Which of the following are mean and variance of standard normal variable?
- (A) Mean = 0, Variance = 1
(B) Mean = 1, Variance = 0
(C) Mean = 0, Variance = 0
(D) Mean = 1, Variance = 1
- 15) What is the area under the normal curve to the right hand side of perpendicular line at $X = \mu$?
- (A) 0
(B) 0.5
(C) 1
(D) -0.5
- 16) Mean and the first quartile for a normal distribution are 15 and 11 respectively. Which of the following is the value of the third quartile?
- (A) 8
(B) 14
(C) 19
(D) 10
- 17) What is the neighbourhood form of $|x - 5| < 0.25$?
- (A) $N(0.25, 5)$
(B) $N(-5, 0.25)$
(C) $N(-5, -0.25)$
(D) $N(5, 0.25)$
- 18) If $y = 10 - 3x$ and $x \rightarrow -3$ then y tends to which value?
- (A) 1
(B) 9
(C) 19
(D) 7

19) What is $\frac{dy}{dx}$ if $y = ax^n$, a is constant?

(A) nx^{n-1}

(B) anx^{n-1}

(C) 0

(D) anx^{n+1}

20) What is the formula for elasticity of demand?

(A) $-\frac{p}{x} \cdot \frac{dx}{dp}$

(B) $\frac{p}{x} \cdot \frac{dx}{dp}$

(C) $-\frac{x}{p} \cdot \frac{dp}{dx}$

(D) $-\frac{p}{x} \cdot \frac{dp}{dx}$

SECTION - B

Answer the following questions in one sentence each. Each question carries 1 mark :

[10]

21) Write the formula to find the rate of inflation.

22) What is the main limitation of scatter diagram method?

23) Will the regression coefficient change if the values of both the variables x and y are doubled with the help of transformation of scale?

24) The linear equation fitted using the data of 7 weeks for a variable y is $\hat{y} = 25.1 - 1.5t$. Estimate the value of y for the eighth week.

25) Define mutually exclusive events.

26) Mean of a symmetrical binomial distribution is 9. Find the value of its parameter n .

27) "Standard score is independent of unit of measurement". Is this statement true or false?

28) The approximate value of mean deviation for a normal distribution is 12. Find its standard deviation.

29) If $\lim_{x \rightarrow -1} 4x + k = 6$ then find the value of k .

30) Define marginal cost.

SECTION - C

Answer the following Any 7 out of 9 questions as directed.
Each question carries 2 marks :

[14]

31) The cost of living index numbers and average monthly wage from the year 2020 to 2023 are given as follows. Find the real wage for each year :

Year	2020	2021	2022	2023
Average monthly wage (₹)	36,000	40,000	52,000	56,000
Cost of living index number	120	150	130	160

32) If the correlation coefficient between two variables X and Y is 0.8 find the value of the following :

(i) $r(x, -y)$

(ii) $r(-x, -y)$

33) If $\bar{x} = 30$, $\bar{y} = 20$ and $b = 0.5$, find the intercept of the regression line of Y on X and write equation of the line.

34) State the components of time series.

35) If two balanced coins are tossed, then find the probability of :

(i) getting one head and one tail.

(ii) getting at least one head.

36) State any four properties of binomial distribution.

37) Express $N(16, 0.5)$ in the interval and modulus form.

38) Find the value of $\lim_{x \rightarrow -2} \frac{x^7 + 128}{x + 2}$

- 39) Determine whether the function $y = 12 + 4x - 7x^2$ is increasing or decreasing at $x = 2$.

SECTION - D

Answer the following Any 8 out of 12 questions as directed.
Each question carries 3 marks :

[24]

- 40) The chain base index numbers of sales of a certain type of scooter from the year 2020 to 2024 are as follows. Find fixed base index numbers :

Year	2020	2021	2022	2023	2024
Index Number of Sale	110	112	109	108	105

- 41) The prices of three items among five fuel items were increased by 50%, 90% and 110% in the year 2024 as compared to the base year 2023. The prices of other two items were decreased by 5% and 2% respectively. If the ratio of importance of these five items is 5 : 4 : 3 : 2 : 1, find the index number of fuel prices for the year 2024.
- 42) The following results are obtained from a bivariate data, $n = 10$, $\Sigma(x - \bar{x})(y - \bar{y}) = 72$, $S_x = 3$, and $\Sigma(y - \bar{y})^2 = 360$, find the correlation coefficient. 0.02
- 43) The information of price (in ₹) of a ball pen and the supply of ball pen (in units) at the end of each month of a year for a company making ball pen is given below. Estimate the supply of ball pen when its price is ₹ 40 :

Detail	Price (x)	Supply (y)
Average	30	500
Variance	25	10,000
Co-variance = 400		

- 44) If the regression line of Y on X is $\hat{y} = 11 + 3x$ and $S_x : S_y = 3 : 10$, find the coefficient of determination.
- 45) State any three merits of graphical method of time series.
- 46) State the characteristics of random experiment.
- 47) If $P(B) = \frac{3}{5}$ and $P(A' \cap B) = \frac{1}{2}$, for two events A and B , find $P\left(\frac{A}{B}\right)$ and $P(A' \cup B')$.
- 48) One number is randomly selected from the natural number 1 to 100. Find the probability that the number selected is either a single digit number or a perfect square.
- 49) The mean and variance of the binomial distribution are 2 and $\frac{6}{5}$ respectively. Find $p(2)$ for this binomial distribution.
- 50) A random variable X denotes the number of accidents per year in a factory and the probability distribution of X is given below :
- | | | | | | |
|---------|------|-------|-------|------|-----|
| $X = x$ | 0 | 1 | 2 | 3 | 4 |
| $p(x)$ | $4K$ | $15K$ | $25K$ | $5K$ | K |
- (i) Find the constant K .
- (ii) Find the probability of the event that one or two accidents will occur in this factory during the year.
- 51) Find $f'(x)$ if $f(x) = (x^2 + 3x + 4)^7$.

SECTION - E

- Answer the following Any 3 out of 4 questions as directed. Each question carries 4 marks :

- 52) The average monthly expense of students residing in university hostel is ₹ 2,000 and its standard deviation is ₹ 500. If the monthly expense of a student follows normal distribution then :

[12]

- (i) Find percentage of students having expense between ₹ 750 and ₹ 1,250.
- (ii) Find percentage of students having expense more than ₹ 1,800

[Note : Blind students should state any four properties of normal distribution.]

- 53) A normal distribution has mean 52 and variance 64. Obtain estimated limits which include exactly middle 60% of the observations. <https://www.gujaratboardonline.com>

[Note : Blind students should define standard normal variable and write its probability function.]

54) Find the value of $\lim_{x \rightarrow 2} \frac{f(x) - f(2)}{x - 2}$ where $f(x) = x^2 + x$. Σ

- 55) The demand function of an item is $P = 30 - \frac{x^2}{10}$. Find the demand and price for maximum revenue.

SECTION - F

- Answer the following Any 4 out of 6 questions as directed. Each question carries 5 marks :

[20]

- 56) Find Laspeyre's, Paasche's and Fisher's index numbers for the year 2024 with base year 2023 from the data about price and consumption of food items given below :

Item	Unit	Year 2024		Year 2023	
		Price (₹)	Quantity	Price (₹)	Quantity
Rice	20 kg.	800	1.5 kg.	780	1 kg.
Milk	Litre	44	10 Litre	40	12 Litre
Bread	kg.	50	1.5 kg.	45	2 kg.
Banana	Dozen	36	1.5 Dozen	30	2 Dozen

- 57) The following information is obtained to study the relationship between the advertisement cost and the sales of electric fans of the companies manufacturing electric fans. Find the correlation coefficient between advertisement cost and sales by Karl-Pearson's method :

Company	A	B	C	D	E	F
Advertisement cost (lakh ₹)	140	120	80	100	80	180
Sales of electric fans (crore ₹)	35	45	15	40	20	50

- 58) From the following information, find the rank correlation coefficient between the sales (in thousand units) and the profit (in lakh ₹) : 0.2

Sales (thousand Units)	25	58	215	72	58	25	90	162
Profit (lakh ₹)	65	140	500	115	65	65	220	340

- 59) To study the relationship between the time of usage of cars and its average annual maintenance cost of a car manufacturing company, the following information is obtained :

Car	1	2	3	4	5	6
Time of usage of a car (Years) x	3	1	2	2	5	3
Average annual maintenance cost (thousand ₹) y	10	5	8	7	13	8

Obtain the regression line of Y on X . Find an estimate of average annual maintenance cost when the usage of a car is 5 years. Also find its error.

- 60) The birth rates of a state in different years are given in the following table. Fit a linear trend for these data. Also find the estimates for birth rates in the year 2025.

Year	2018	2019	2020	2021	2022	2023	2024
Birth rate	22.2	21.8	21.3	20.9	20.6	20.2	19.9

- 61) Find the trend using four yearly moving averages for the following data showing yearly sales (in lakh ₹) of a shop :

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Sales (lakh ₹)	5	3	7	6	4	8	9	10	8	9

