QUESTION PAPER 1

SECTION A

1. (c) Fixed base method

2. (d) Retail price

3. (c) $-1 \leq r \leq 1$

4. (b) Perfect Negative Correlation

5. (b) Regression

6. (d) 0

7. (a) Random

8. (c) t

9. (b) 0

10. (a) Mathematical definition

11. (d) Birth year of a student

12. (b) 3

13. (b) $^{n}C_{p}p^{0}q^{n}$

14. (b) 0.5

15. (c) 68.26 %

16. (a) $\frac{4}{5}\sigma$

17. (b) $|x - 3| < 0.3$

18. (a) 10

19. (b) $an\,x^{n-1}$

20. (d) $\dfrac{u\frac{dv}{dx} - v\frac{du}{dx}}{u^2}$

SECTION B

21. The wholesale price index number is used to find the rate of inflation. It's formula is as follows :

$$\text{Rate of inflation} = \frac{\left(\begin{array}{c}\text{Wholesale price}\\\text{index number of}\\\text{current year}\end{array}\right) - \left(\begin{array}{c}\text{Wholesale price}\\\text{index number of}\\\text{preceding year}\end{array}\right)}{\text{Wholesale price index number of preceding year}} \times 100$$

22. If simultaneous changes occur in the values of two related variables due to direct or indirect cause and effect relation, then there exists correlation between the variables.

23. The linear regression model is of the form $Y = \alpha + \beta X + u$; where α and β are constants, u is error variable.

QUESTION PAPER 2

SECTION A

1. (c) 133.33
2. (a) Consumption of base year
3. (b) – 1.07
4. (a) Perfect positive
5. (b) 64 %
6. (d) 45
7. (d) Zero
8. (a) Random
9. (d) Impossible event
10. (c) $0 \leqslant P(A) \leqslant 1$
11. (b) 2
12. (b) 3
13. (c) $\frac{1}{14}$
14. (b) 95.45 %
15. (c) $f(x) = \frac{1}{\sigma\sqrt{2\pi}}\, e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$, $-\infty < x < \infty$
16. (b) Positive
17. (a) (4.75, 5.25)
18. (d) 108
19. (c) $f'(a) = 0$, $f''(a) > 0$
20. (c) Stationary values

SECTION B

21. The wholesale price index number is used to find the rate of inflation and the cos of living index number is used to find the rate of dearness allowance.

22. Suppose (x, y), (x_2, y_2), $(x_3, y_3) \dots (x_n, y_n)$ are ordered pairs of n values of tw variables X and Y. These values are plotted on the graph. This graph is called Scatter Diagram. The main limitation of scatter diagram method is that this meth does not give exact degree of correlation between two variables.

23. The linear regression model is of the form $Y = \alpha + \beta X + u$; where α and β a constants, u is error variable.

24. Moving average method of finding trend is best to eliminate the effect of repetiti short-term variations.

25. **Random experiment :** The experiment which can be independently repeated und identical conditions and all its possible outcomes are known but it cannot be predict with certainty which of the outcome will appear is called a random experiment.

Favourable outcomes : If some outcomes out of all the elementary outcomes in the sample space of a random experiment indicate the occurrence of a certain event A, then these outcomes are called the favourable outcomes of the event A.

26. Suppose, a dichotomous experiment with only two outcomes – Success (S) and Failure (F) – is repeated n times under identical conditions and in each trial probability of success (S) $p (0 < p < 1)$ is constant, then all such trials are called Bernoulli trials.

27. In probability density function of normal variable, the values of the constants are $\pi = 3.1416$ and $e = 2.7183$.

28. "Standard score is independent of unit of measurement." This statement is true.

29. 0.001 neighbourhood of -5 in modulus form is expressed by

$|x - (-5)| < 0.001 = |x + 5| < 0.001.$

30. $f(x) = 9x^2 - 8x + 6$

$\therefore f'(x) = 9 (2x) - 8 (1) + 0$

$\qquad = 18x - 8$

QUESTION PAPER 3

SECTION A

1. (d) Retail price
2. (c) $p_0 q_1$
3. (b) Perfect Negative Correlation

4. (c) $-1 \leq r \leq 1$
5. (b) Square of correlation coefficient

6. (d) $b_{yx} = r \cdot \dfrac{S_y}{S_x}$
7. (d) Method of moving average

8. (a) y_t
9. (b) $\dfrac{1}{n}$
10. (a) Classical definition

11. (b) 3
12. (b) 5.59
13. (a) $^nC_0 p^n q^0$

SECTION B

21. **Index number :** The percentage change in the value of a variable associated with any item for the current period compared to its value in a fixed period (base period) is called an index number.
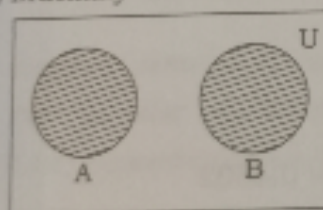
    Cost of living index number : The number showing the percentage of relative changes in the cost of living of people of a certain section of the society in the current year as compared to the base year is called the cost of living index number.

22. The sign (r) of correlation coefficient depends on covariance. If the value of the covariance is negative, the sign of r will be negative and if the value of the covariance is positive, then the sign of r will be positive.

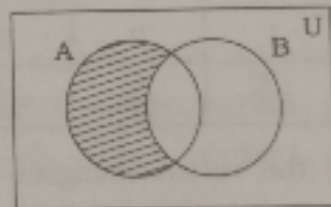23. The regression coefficient is independent of change of origin and is not independent of change of scale.

24. An interval of 10 – 15 years is required to know the trend in agricultural yield or industrial production, whereas it may be clear within 4 – 5 years in the sale of electronic goods.

25. (1) Mutually exclusive events   (2) Difference event A – B

$A \cap B = \phi$ A – B

26. The value of parameter n obtained is 14.

27. Third quartile $Q_3 = 19$

28. 95.45 % of area is covered under the normal curve within the range $\mu - 2\sigma$ to $\mu + 2\sigma$.

29. $k = 10$

30. **Marginal revenue :** The change in revenue due to small change in demand is called marginal revenue.

    Marginal cost : The change in cost due to small change in production is called marginal cost.

SECTION C

QUESTION PAPER 4

SECTION A

1. (c) 550

2. (c) Fixed base method

3. (b) 1 or −1

4. (b) Covariance of X and Y

5. (b) Sir Francis Galton

6. (c) 37.5

7. (a) Long-term component

8. (a) Random component

9. (d) 6^3

10. (b) 0

11. (b) n and p

12. (b) 3

13. (a) $\frac{1}{5}$

14. (c) (14, 26)

15. (c) 1

16. (d) 2.7183

17. (c) $x \to 2$

18. (d) $|x - 5| < 0.02$

19. (b) $-\frac{8}{x^3}$

20. (c) $\frac{dp}{dx} = 0$

SECTION B

21. The number associated with items in proportion to their importance is called weight. The two popular methods of assigning explicit weight are as follows :
    (1) Total expenditure method and (2) Family budget method.

22. The assumptions of Karl Pearson's method are as follows :
    (1) There is linear correlation between two variables.
    (2) There is cause-effect relation between two variables.

23. Interpretation of regression coefficient b :
    b = the estimated change in the value of Y for a unit change in the value of X.
    i.e., when $b > 0$, it means that a unit increase in the value of independent variable X implies an estimated increase of b units in the value of dependen variable Y.

    when $b < 0$, it means that a unit increase in the value of independent variab X implies an estimated decrease of $|b|$ units in the value dependent variable Y.

24. When the effect of short-term variations is to be eliminated to find trend, meth of moving average is more useful.

25. The formula for the probability of occurrence of at least one event out of th events A, B and C is as follows :
    $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$

26. $p = \frac{1}{4}$, is less than $\frac{1}{2}$. Hence, there is positive skewness in binomial probab distribution.

27. For $Z = 0$, the standard normal curve is symmetric on both the sides.

28. Here, quartile deviation $= 12$

In normal distribution,

Estimated value of quartile deviation $\approx \frac{2}{3} \sigma$

$\therefore 12 \approx \frac{2}{3} \sigma$

$\therefore \sigma \approx \frac{12 \times 3}{2} \approx 18$

Hence, the value of standard deviation obtained is 18.

29. Interval form : $(15.5, 16.5)$; Modulus form : $|x - 16| < 0.5$

30. If $y = 6x^3 + \frac{7}{2}x^2 + \frac{6}{5}x - 8$, then $\frac{dy}{dx} = 6(3x^2) + \frac{7}{2}(2x) + \frac{6}{5}(1) - 0 = 18x^2 + 7x + \frac{6}{5}$.

QUESTION PAPER 5

1. (c) $I_F = I_P = I_L$

2. (c) Expenditure of base year

3. (d) does not have any unit

4. (b) $\frac{m^3 - m}{12}$

5. (a) $y - \hat{y}$

6. (c) $\hat{y} = a + bx$

7. (d) 37.6

8. (b) $y_t = T_t + S_t + C_t + R_t$

9. (a) Independent events

10. (b) $P(B)$

11. (b) Negatively skewed

12. (b) 1

13. (d) Continuous random variable

14. (a) $\frac{4}{5} \sigma$

15. (d) $Z = \frac{x - \mu}{\sigma}$

16. (a) 3

17. (b) Interval

18. (c) $(-2.02, -1.98)$

19. (a) a

20. (d) $R = ax - bx^2$

SECTION B

21. The important basic tests of index number are : (1) Time reversal test and (2) Factor reversal test.

22. When the values of two related variables are some arrangement of first n natural numbers, the correlation coefficients obtained by Karl Pearson's method and Spearman's method are equal.

23. There are two methods for fitting a regression line : (1) Method of Scatter Diagram and (2) Method of Least Squares. Out of which method of least squares is best.

24. The seasonal components and cyclical component of time series produce short-term variations.

25. The sample space of a random experiment of throwing one balanced die and a balanced coin simultaneously is obtained as follows :

$U = \{(1, H), (2, H), (3, H), (4, H), (5, H), (6, H), (1, T), (2, T), (3, T), (4, T), (5, T), (6, T)\}$

Where, H = Head; T = Tail; 1, 2, 3, 4, 5, 6 = Numbers on die.

27. The value of normal variable $X = \mu$ [mean] divides the area of normal curve in two equal parts.

28. The standard deviation obtained is 10.

29. $k = 5$

30. Defination : The ratio of percentage change in the demand of a commodity due to percentage change in its price is called elasticity of demand.

Formula : Elasticity of demand $= -\dfrac{\text{Percentage change in demand}}{\text{Percentage change in price}}$

52. (1
53. Me
54. Th
55. 17

Trend	–	–	16.8	18.6	21.2	22.6	23.2	–	–

QUESTION PAPER 6

SECTION A

1. (b) Wholesale price index number   2. (d) Cost of living index number

3. (d) Spearman's method   4. (b) $r = -1$

5. (a) By Least Square Method   6. (a) $(\bar{x}, \bar{y})$ 7. (a) $y_t = \alpha + \beta t + u_t$

8. (c) Increase in the number of tourists during school vacation

9. (a) 0   10. (c) To measure the life of electric bulb

11. (d) 16   12. (a) Two   13. (c) 0.10

14. (a) Mean = 0, Variance = 1   15. (b) 100   16. (b) $\frac{2}{3}$

17. (c) [ ]   18. (c) 19   19. (d) $\dfrac{u \cdot \frac{dv}{dx} - v \cdot \frac{du}{dx}}{u^2}$

20. (b) A technique

SECTION B

21. The Geometric mean is the best average and the weighted mean is the appropriate average for the construction of index number. ·

22. The value of r is 1 or -1 when all the points in the scatter diagram lie on the same (single) line, but when all the points are not on the same line then the range of value of r is between -1 to 1.

23. The difference between the observed value y of the variable Y and the estimated value $\hat{y}$ of y obtained by the regression model is called an error in context with a regression line. It is denoted by 'e'. Thus, $e = y - \hat{y}$.

24. The method to obtain the estimates of different components of a time series is called analysis of time series.

25. 0, $P(A \cap B)$, $P(A)$, $P(A \cup B)$, $P(A) + P(B)$ are in the ascending order.

26. The relation between mean and variance of binomial distribution is that the value of mean is always greater than variance, i.e., $np > npq$.

27. The value of normal variable $X = \mu$ (mean) divides the area of normal curve in two equal parts.

28. The standard deviation obtained is 10.

29. $k = 5$

30. Defination : The ratio of percentage change in the demand of a commodity due to percentage change in its price is called elasticity of demand.

Formula : Elasticity of demand $= -\dfrac{\text{Percentage change in demand}}{\text{Percentage change in price}}$

SECTION C