1. One sample t-test, for testing population mean to a specified value (μ_0) is given by:

(a) $t = \frac{\bar{x} - \mu_0}{\frac{S}{n}}$ (b) $t = \frac{\bar{x} - \mu_0}{\frac{S}{\sqrt{n}}}$

(c) $t = \frac{\bar{x} - \mu_0}{\frac{S}{n^2}}$ (d) $t = \frac{\bar{x} - \mu_0}{\frac{\sqrt{S}}{n}}$

2. Three partners shared a profit in a business in the ratio of 2 : 3 : 6. They had partnered for 12 months, 9 months and 6 months respectively. The ratio of their investment is:

(a) 1 : 2 : 6 (b) 1 : 2 : 4

(c) 2 : 6 : 1 (d) 2 : 1 : 4

3. A company has a fixed cost of ₹ 40,000. Arrange the break even points of the following four cases in the ascending order.

A. Cost of production of one item is ₹ 30 and it sells at ₹ 50

B. Cost of production of one item is ₹ 40 and it sells at ₹ 50

C. Cost of production of one item is ₹ 50 and it sells at ₹ 55

D. Cost of production of one item is ₹ 20 and it sells at ₹ 60

Choose the **correct** answer from the options given below:

(a) D < A < C < B (b) D < A < B < C

(c) B < C < D < A (d) D < C < B < A

4. In a 300 m race, A reaches the finish point in 20 sec and B reaches in 25 sec. By how much distance A beat B ?

(a) 50 m (b) 60 m

(c) 75 m (d) 40 m

5. If x < y and z < 0 then :

(a) x + z > y – z (b) $\frac{x}{z} < \frac{y}{z}$

(c) $\frac{x}{z} > \frac{y}{z}$ (d) x + z > y + z

6. If $y = \log\left(\sqrt{x+1} - \sqrt{x-1}\right)$, then $\left(x^2 - 1\right)\frac{d^2y}{dx^2} + x\frac{dy}{dx}$ is equal to:

(a) $x + x^2$ (b) x^2

(c) x (d) 0

7. The average cost function associated with producing and marketing x units of an item is given by $AC = 2x - 11 + \frac{50}{x}$ then the marginal cost of 10 items will be:

(a) 14 (b) 140

(c) 29 (d) 10

8. If the corner points of the feasible region for an LPP are (0, 2), (3, 0), (6, 0), (6, 8) and (0, 5) then (maximum of z – minimum of z) for the objective function z = 4x + 6y is:

(a) 18 (b) 48

(c) 60 (d) 42

9. Match **List - I** with **List - II**.

Let X be a discrete random variable and $P(X = x_i) = p_i$.

List - I	**List - II**
A. E(X)	I. $\sum x_i^2 p_i - (\sum x_i p_i)^2$
B. $E(X^2)$	II. $\sum x_i p_i$
C. σ_x^2 (Variance)	III. $\sqrt{\Sigma x_i^2 p_1 - \left(\Sigma x_i p_1\right)^2}$
D. σ_x (Standard Deviation)	IV. $\sum x_i^2 p_i$

Choose the **correct** answer from the options given below:

(a) A-III, B-IV, C-I, D-II (b) A-IV, B-II, C-I, D-III

(c) A-II, B-IV, C-III, D-I (d) A-II, B-IV, C-I, D-III

10. The rate per annum compounded semi-annually so that the present value of a perpetuity of ₹ 4,000 payable at the beginning of each 6 month be ₹ 54,000 is:

(a) 8% (b) 7.4%

(c) 16% (d) 14.8%

11. The price Index Number by simple aggregative method for the year 2018 by taking year 2017 as base year from the data given below, is:

Commodity	Price in 2017(₹)	Price in 2018 (₹)
Rice	50	55
Wheat	25	27
Fish	80	74
Potato	25	30
Onion	20	30
	$\sum P_0$=200	$\sum P_1$=216

(a) 85.2 (b) 108

(c) 216 (d) 84

12. If $x = \log_e t$, $y = \frac{1}{t}$ then $\frac{d^2y}{dx^2} + \frac{dy}{dx}$ is equal to:

(a) 0 (b) $2e^{-x}$

(c) e^x (d) $-2e^{-x}$

13. A company has issued a bond having the face value ₹ 4,000, carrying a coupon rate of 12% to be paid semi-annually. If the bond is maturing in 10 years then the semi-annual dividend payment (in ₹) is :

(a) 360 (b) 280

(c) 240 (d) 480

14. The function $f(x) = \frac{x}{2} + \frac{2}{x}$, $x \in \mathbb{R} - \{0\}$, :

(a) has a local maximum at x = 2 and a local minimum at x = – 2

(b) is increasing in (–2, 0)

(c) has a local minimum at x = 2 and a local maximum at x = – 2

(d) is decreasing in $(2, \infty)$

15. Which of the following is not an example of a statistic?

(a) Average height of 20 students selected from a school

(b) Standard deviation of income of all workers in a factory

(c) Standard deviation of runs scored by Virat Kohli from his selected 10 one-day matches

(d) Average weight of first fifteen patients visiting a hospital

16. A furniture company buys back its sold items at ₹ 2,500 per item (having remaining useful life > 3 years at the time of purchase).

Mr. Mohan had purchased a table and a sofa set costing ₹ 4,000 and ₹ 21,000 respectively, having useful life of 10 years each. After 5 years he returns back these two pieces of furniture. The total estimated annual depreciation of the two furniture pieces is:

(a) ₹ 4,500 (b) ₹ 4,000

(c) ₹ 2,000 (d) ₹ 2,250

17. The optimal value of the LPP:

max z = 4x + y

$x + y \leq 50$

$3x + y \leq 90$

$x, y \geq 0$ occurs at the point:

(a) (40, 10) (b) (30, 0)

(c) (20, 30) (d) (0, 50)

18. If A and B are any symmetric matrices each of order 3 × 3 then AB – BA is :

(a) a symmetric matrix

(b) a skew-symmetric matrix

(c) a zero matrix

(d) an identity matrix

19. If the index number of the current year is computed on the basis of quantities of base year (P_{01}) and another index number is computed on the basis of quantities of current year (P_{10}) and index numbers satisfy time reversed test, then $P_{01} \cdot P_{10}$ =

(a) $\frac{3}{2}$ (b) 1

(c) 2 (d) $\frac{1}{2}$

20. Match **List - I** with **List - II**.

List - I **Matrix**		**List - II** **Types of matrix**
A.	$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 5 & 7 \\ 0 & 0 & 4 \end{bmatrix}$	II. Skew symmetric matrix
B.	$\begin{bmatrix} 1 & 3 & 5 \\ 3 & 0 & 4 \\ 5 & 4 & 2 \end{bmatrix}$	II. Upper triangular matrix
C.	$\begin{bmatrix} 0 & -2 & 1 \\ 2 & 0 & 5 \\ -1 & -5 & 0 \end{bmatrix}$	III. Symmetric matrix
D.	$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 4 \end{bmatrix}$	IV. Diagonal matrix

Choose the **correct** answer from the options given below:

(a) A-III, B-IV, C-II, D-I (b) A-IV, B-III, C-I, D-II

(c) A-I, B-II, C-III, D-IV (d) A-II, B-III, C-I, D-IV

21. Let $X \sim Bin(3, p)$ be a binomial random variable. If $P(X = 3) = \frac{1}{12} P(X = 1)$, then p is equal to:

(a) $\frac{1}{3}$ (b) $\frac{2}{3}$

(c) $\frac{2}{5}$ (d) $\frac{3}{5}$

22. If a boat can row upstream at 12 km/hr, and downstream at 20 km/hr, then the speed (in km/hr) of the stream and the speed (in km/hr) of the boat in still water are respectively:

(a) 4, 16 (b) 4, 14

(c) 6, 16 (d) 16, 4

23. If z_0 and z_1 are respectively the minimum and the maximum values of $z = -3x + 4y$ over the feasible region represented by constraints

$x + 2y \leq 8$

$3x + 2y \leq 12$

$x \geq 0, y \geq 0$

then $z_1 + z_0$ is equal to :

(a) 22 (b) -6

(c) 4 (d) 16

24. In what ratio must a shopkeeper mix two types of oranges worth ₹ 55 per kg and ₹ 70 per kg respectively so as to get a mixture at ₹ 65 per kg.

(a) 1 : 2 (b) 2 : 3

(c) 15 : 10 (d) 10 : 15

25. If $x^y = e^{x-y}$, $x > 0$, then $\frac{dy}{dx}$ is equal to :

(a) $-\left[\frac{\log_e x}{(1+\log_e x)^2}\right]$ (b) $\frac{\log_e x}{(1+\log_e x)^2}$

(c) $-\frac{\log_e x}{1+\log_e x}$ (d) $\frac{\log_e x}{1+\log_e x}$

26. Match **List - I** with **List - II**.

List - I		**List - II**
A. The index number based on weighted aggregates	II.	$p_{01} = \frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$
B. Paasche's index number	II.	$p_{01} = \frac{\Sigma p_1 w}{\Sigma p_0 w} \times 100$
C. Laspayre's index number	III.	$p_{01} = \sqrt{\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times \frac{\Sigma p_1 q_1}{\Sigma q_0 q_1}} \times 100$
D. Fisher's ideal index	IV.	$p_{01} = \frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$

Choose the **correct** answer from the options given below:

(a) A-I, B-II, C-III, D-IV (b) A-I, B-II, C-IV, D-III

(c) A-II, B-I, C-IV, D-III (d) A-IV, B-III, C-II, D-I

27. The value of $13 \underset{15}{\odot} 18$ where $\underset{15}{\odot}$ is multiplication modulo 15:

(a) 7 (b) 3

(c) 9 (d) 4

28. If the cost of a car is ₹ 10,00,000 and its scrap value after fifteen years is ₹ 1,00,000, then yearly depreciation using straight line method is:

(a) ₹ 75,000 (b) ₹ 60,000

(c) ₹ 50,000 (d) ₹ 40,000

29. Shanky takes a loan ₹ 4,00,000 at an interest of 6% p.a. for 10 years. He wants to pay back in equal monthly installmens. What is his EMI in ₹ amount when calculated by reduced balanced method?

$\left(\text{use}\ \frac{0.005}{1-(1.005)^{-120}} = 0.0111\right)$

(a) 4444 (b) 6444

(c) 4244 (d) 4440

30. The probability distribution of a random variable X is given by:

X	1	2	3	4	5
P(X)	2K	K	3K	4K	K

Then the value of K is:

(a) $\frac{1}{12}$ (b) $\frac{1}{11}$

(c) $\frac{1}{10}$ (d) $\frac{1}{9}$

31. Pipe A can fill a tank 6 times faster than a pipe B. If B can fill a tank in 21 minutes, then time taken by both the pipes to fill the tank is:

(a) 7 minutes (b) 3 minutes

(c) 6 minutes (d) 2.5 minutes

32. A particle moves along the curve $y^2 = 16x$. A point on this curve at which the ordinate increases at twice the rate of abscissa is:

(a) (4, 1) (b) (8, 2)

(c) (2, 3) (d) (1, 4)

33. If the mean and the variance of a binomial distribution are 6 and 4 respectively, then the probability of no success is::

(a) $\left(\frac{2}{3}\right)^{18}$ (b) $\left(\frac{1}{2}\right)^{18}$

(c) $\left(\frac{1}{3}\right)^{18}$ (d) $\left(\frac{2}{5}\right)^{18}$

34. A simple random sample consists of three observations 7, 9, 11. The point estimate of the population standard deviation is:

(a) 2.5 (b) 1.44

(c) 2 (d) 4

35. A person bought 750 shares of a company quoted at ₹ 320. The amount spent by him on this purchase, if the brokerage be 2.5% is:

(a) ₹ 2,26,000 (b) ₹ 2,46,000

(c) ₹ 3,36,000 (d) ₹ 2,32,000

36. The differential equation representing the family of curves $y = A\cos(x + B)$, where A and B are arbitrary constant is:

(a) $\frac{d^2y}{dx^2} + y = 0$ (b) $\frac{d^2y}{dx^2} + x = 0$

(c) $\frac{dy}{dx} + y = 0$ (d) $\frac{dy}{dx} + x = 0$

37. If $y = x\log x$, then which of the following is correct?

(a) $x\frac{dy}{dx} - x = y$ (b) $x\frac{dy}{dx} + y = x$

(c) $x\frac{dy}{dx} + xy = x$ (d) $y\frac{dy}{dx} + x = y$

38. The value of determinant $\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$ is:

(a) $(a-b)(b-c)(c-a)$ (b) abc

(c) $a^2 + b^2 + c^2$ (d) 0

39. If a and b are the order and degree of differential equation $\frac{\left[1+\left(\frac{dy}{dx}\right)^{\frac{3}{2}}\right]}{\frac{d^2y}{dx^2}} = K$ respectively, then the value of a + 2b is:

(a) $\frac{3}{2}$ (b) 2

(c) 3 (d) 6

40. Value of $\int_{-4}^{4} |x+2|\,dx$ is:

(a) 20 (b) 0

(c) 40 (d) 2

41. Consider the LPP,

Max z = 2x + 3y, subject to the conditions,

$x + y \le 2$,

$x \le 2$

$x \ge 0$; $y \ge 0$, then maximum value of the objective function is:

(a) 8 (b) 6

(c) 4 (d) 0

42. The point on the curve $y^2 = 8x$ for which the abscissa and ordinate change at the same rate is:

(a) (2, 4) (b) (4, 2)

(c) (0, 2) (d) (2, 0)

43. The mean of the following probability distribution is:

X = x	0	1	2
P(X = x)	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{1}{4}$

(a) 1 (b) $\frac{2}{3}$

(c) $\frac{1}{3}$ (d) 4

44. The region represented by the system of inequalities $x, y \ge 0$; $-2x + y \le 4$; $x + y \ge 3$ and $x - 2y \le 2$ is:

(a) unbounded in first quadrant

(b) unbounded in first and second quadrant

(c) bounded in first quadrant

(d) not feasible

45. Which of the following matrix is not skew symmetric matrix?

(a) $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & -3 \\ 3 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & -3 \\ 2 & 3 & 0 \end{bmatrix}$

46. An unbiased die is rolled. If the random variable X is defined as,

$X = \begin{cases} 1 \text{ if the outcome is a number less than or equal to 3} \\ 0 \text{ if the outcome is a number greater than 3} \end{cases}$

Then the probability distribution of X is :

(a)

X	0	1
P(X)	0	1

(b)

X	0	1
P(X)	$\frac{1}{3}$	$\frac{1}{3}$

(c)

X	0	1
P(X)	$\frac{1}{2}$	$\frac{1}{2}$

(d)

X	0	1
P(X)	$\frac{1}{4}$	$\frac{1}{4}$

47. Let A, B, C be matrices of order p × k, 3 × k and n × 3 respectively, then the conditions on n, k and p so that AB + CB will be defined are:

(a) k = 2, p = 3 (b) k = 3, p = n

(c) k = n (d) k is arbitrary, p = 2

48. $\int \frac{dx}{\sqrt{5-x}}$ = (where C is arbitrary constant.)

(a) $\sqrt{5-x}+C$ (b) $-\sqrt{5-x}+C$

(c) $2\sqrt{5-x}+C$ (d) $-2\sqrt{5-x}+C$

49. If $\begin{vmatrix} 3x & 7 \\ 4 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 4 & 2 \end{vmatrix}$, then the value of x is:

(a) ± 6 (b) ± 4

(c) $4\sqrt{2}$ (d) $4\sqrt{3}$

50. The maximum profit that a company can make if the profit function is $P(x) = 41 + 24x - 18x^2$ is:

(a) 39 (b) 59

(c) 49 (d) 29