CAT 2019 – STATISTICS

1. If n is a positive integer, the number of terms in Binomial series is

(A) n

(B) $n-1$

(C) $n+1$

(D) Infinite

2. The coefficient of x^n in the expansion of $\frac{1}{1-x^2}$ is

(A) 1
(B) 0
(C) 1 if n is even and 0 if n is odd
(D) 0 if n is even and 1 if n is odd

3. $\log_e(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} + \ldots\ldots$ is valid if the value of x is such that

(A) $-1 \le x \le 1$

(B) $-1 < x < 1$

(C) $-1 < x \le 1$

(D) $-1 \le x < 1$

4. Let $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$. Then the matrix A is

(A) Singular
(B) Diagonal
(C) Skew-symmetric
(D) Symmetric

5. Let A be a square matrix. If $A^T = -A$ then the matrix A is

(A) Symmetric
(B) Skew-symmetric
(C) Diagonal
(D) Zero

6. Let $A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$. Then the matrix $A + A^T$ is a

(A) Zero matrix
(B) Unit matrix
(C) Symmetric matrix
(D) Skew –symmetric matrix

7. The rank of the matrix $A = [1\,3\,4\,5\,1\,0]$ ¿ ¿ is

(A) 2
(B) 5
(C) 1
(D) 0

8. The Eigen values of a diagonal matrix $\begin{vmatrix} d_1 & 0 & 0 \\ 0 & d_2 & 0 \\ 0 & 0 & d_3 \end{vmatrix}$ are

(A) d_1, d_2, d_3

(B) d_1, d_2

(C) d_1, d_3

(D) d_2, d_3

9. Product of the Eigen values of the matrix $\left(1\,2\,-1\right|\left)\left(-2\,0\,0\right|\right)$ ¿ ¿ is

(A) 1
(B) 0
(C) 5
(D) 10

10. Sum of the Eigen values of the matrix $A = \left(1\,1\,1\right|\left)\left(1\,2\,2\right|\right)$ ¿ ¿ is

(A) 3
(B) 6
(C) 5
(D) 4

11. If $x = r\cos\theta,\ y = r\sin\theta,$ then $\frac{\partial(x,y)}{\partial(r,\theta)}$ is equal to

(A) $-r$
(B) r
(C) $\sin\theta$
(D) $\cos\theta$

12. If $f(x)$ is even, then $\int_{-a}^{a} f(x)dx$ is equal to

(A) $2\int_{-a}^{a} f(x)dx$

(B) $2\int_{a}^{0} f(x)dx$

(C) $2\int_{0}^{a} f(x)dx$

(D) $-2\int_{0}^{a} f(x)dx$

13. The value of $\Gamma(1)$ is

(A) -1

(B) 0

(C) 1

(D) 2

14. If $\Gamma(n+1) = 90\,\Gamma n-1$, the value of n is

(A) 9

(B) 10

(C) 90

(D) 19

15. The value of $\beta(4,2)$ is

(A) $\frac{1}{10}$

(B) $\frac{1}{20}$

(C) $\frac{1}{8}$

(D
) $\frac{1}{6}$

16. Which one of the following is not correct?

(A) $\Gamma\left(\frac{1}{2}\right)=\sqrt{\pi}$

(B) $\beta(m,n)=\beta(n,m)$

(C) $\Gamma n+1=(n-1)\Gamma n$

(D) $\beta(m,n)=\frac{\Gamma m \Gamma n}{\Gamma m+n}$

17. Which one of the following is not a two dimensional diagram?

(A) Square diagram
(B) Multiple bar diagram
(C) Rectangular diagram
(D) Pie-chart

18. The A.M of two numbers is 6.5 and their G.M is 6. The two numbers are

(A) 9, 6
(B) 9, 5
(C) 7, 6
(D) 4, 9

19. Mean deviation is minimum when deviations are taken from

(A) Mean
(B) Median
(C) Mode
(D) Zero

20. If each value of a series is multiplied by a constant C, the coefficient of variation as compared to original value is

(A) Increased
(B) Decreased
(C) Unaltered
(D) Zero

21. If $A \subset B$, the probability, $P(A/B)$ is equal to

(A) Zero

(B) One

(C) $P(A)/P(B)$

(D) $P(B)/P(A)$

22. If a number is selected randomly from each of the two sets

1, 2, 3, 4, 5, 6, 7, 8

2, 3, 4, 5, 6, 7, 8, 9

then the probability that the sum of the numbers is equal to 9 is

(A) 8/91

(B) 7/72

(C) 14/81

(D) 7/64

23. If $P(A \mid B) = 1/4$ and $P(B \mid A) = 1/3$, then $P(A)/P(B)$ is equal to

(A) 3/4

(B) 7/12

(C) 4/3

(D) 1/12

24. If X is a random variable which can take only non-negative values, then

(A) $E(X^2) = [E(X)]^2$

(B) $E(X^2) \leq [E(X)]^2$

(C) $E(X^2) \geq [E(X)]^2$

(D) None of the above

25. Negative binomial distribution, $\mathrm{NB}(x\,;r\,,p)$ for $r=1$ reduces to

(A) Binomial distribution
(B) Poisson distribution
(C) Hypergeometric distribution
(D) Geometric distribution

26. An approximate relation between Q.D and S.D of a normal distribution is

(A) 5Q.D = 4 S.D
(B) 4 Q.D = 5 S.D
(C) 2 Q.D = 3 S.D
(D) 3 Q.D= 2 S.D

27. Mode of the chi-square distribution with n.d.f lies at the point

(A) $\chi^2 = m - 1$
(B) $\chi^2 = n$
(C) $\chi^2 = n - 2$
(D) $\chi^2 = 1/(n - 2)$

28. Stratified sampling belongs to the category of

(A) Judgement sampling
(B) Subjective sampling
(C) Controlled sampling
(D) Non-random sampling

29. Systematic sampling means

(A) Selection of *n* contiguous units
(B) Selection of *n* units situated at equal distances
(C) Selection of *n* largest units
(D) Selection of *n* middle units in a sequence

30. If an estimator T_n of population parameter θ converges in probability to θ as *n* tends to infinity then T_n is said to be

(A) Sufficient
(B) Efficient
(C) Consistent
(D) Unbiased

31. Sample median as an estimator of population mean is always

(A) Unbiased
(B) Efficient
(C) Sufficient
(D) None of the above

32. The maximum likelihood estimators are necessarily

(A) Unbiased

(B) Sufficient
(C) Most efficient
(D) Unique
)

33. Degree of freedom is related to

(A) Number of observations in a set
(B) Hypothesis under test
(C) Number of independent observations in a set
(D) None of the above

34. The decision criteria in SPRT depends on the functions of

(A) Type I error
(B) Type II error
(C) Type I and II errors
(D) None of the two types of errors

35. Kolmogorov-Smirnov test is a

(A) One left-sided test
(B) One right-sided test
(C) Two-sided test
(D) All of the above

36. If the two lines of regression are coincident the relation between the two regression coefficients is

(A) $\beta_{YX} = \beta_{XY}$
(B) $\beta_{YX} . \beta_{XY} = 1$
(C) $\beta_{YX} \leq \beta_{XY}$
(D) $\beta_{YX} = -\beta_{XY}$

37. If $\rho = 1$, the relation between the two variables X and Y is

(A) Y is proportional of X

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(B) Y is inversely proportional to X

(C) Y is equal to X

(D None of the above

)

38. The consistent increase in production of cereals constitutes the component of the time series

(A) Secular trend
(B) Seasonal variation
(C) Irregular variation
(D) All of the above

39. Combining of two index numbers series having different base periods into one series with common base period is known as

(A) Splicing
(B) Base shifing
(C) Both (A) and (B)
(D) Neither (A) nor (B)

40. The graph of the proportion of defectives in the lot against average sample number is

(A) OC curve
(B) A.S.N curve
(C) Power curve
(D) All of the above

41. In the analysis of data of RBD with b block and v treatments, the error degrees of freedom are

(A) $b(v-1)$

(B) $v(b-1)$

(C) $(b-1)(v-1)$

(D) None of the above

42. If two Latin Square are such that one can be obtained by interchanging the rows of one with columns of the other, then the Latin squares are said to be

(A) Conjugate
(B) Self conjugate
(C) Orthogonal
(D) Asymmetric

43. The method of confounding is a device to reduce the size of

(A) Experiments
(B) Replications
(C) Blocks
(D) All of the above

44. If $X \sim b(n, p)$, the distribution of $Y = (n - X)$ is

(A) $b(n, 1)$
(B) $b(n, x)$
(C) $b(n, p)$
(D) $b(n, q)$ where $q = 1 - p$

45. If X is Poisson variate with parameter μ, the moment generating function of Poisson variate is

(A) $e^{\mu t-1}$
(B) $e^{\mu(e^{t}-1)}$
(C) $e^{\mu(e^{t}-1)}$
(D) $e^{i\mu(e^{t}-1)}$

46. The relation between the mean and variance of χ^2 with n.d.f is

(A) Mean = 2 variance
(B) 2 mean = variance
(C) Mean = variance
(D) None of the above

)

47. If X and Y are distribution as χ^2 with d.f n_1 and n_2 respectively, the distribution of the variate X/Y is

(A) $\beta_I(\frac{n_1}{2}, \frac{n_2}{2})$

(B) $\beta_{II}(\frac{n_1}{2}, \frac{n_2}{2})$

(C) χ^2 with df ($n_1 - n_2$)

(D) All of the above

48. F-distribution curve in respect of tails is

(A) Negative skewed
(B) Positive skewed
(C) Symmetrical
(D) None of the above

49. The variable $y = -2 \log x$ where x is distributed as $U(0,1)$ follows

(A) F-distribution

(B) t-distribution

(C) χ^2-distribution

(D) Exponential distribution

50. The number of possible samples of size n out of N population units without replacement is

(A) $(N|)$ ¿ ¿

(B) $(N)_n$

(C) n^2

(D) $n!$

51. Probability of drawing a unit at each selection remains same in

(A) srswor
(B) srswr
(C) both (A) and (B)
(D) None of (A) and (B)

52. If $X_1, X_2, \ldots, X_n$ is a random sample from a population $N(0, \sigma^2)$, a sufficient statistic for σ^2 is

(A) $\sum X_i$

(B) $\sum X_i^2$

(C) $(\sum X_i)^2$

(D) None of the above

53. Mean squared error of an estimator T_n of $\tau(\theta)$ is expressed as

(A) $bias + \mathrm{var}_\theta(T_n)$

(B) $[bias + \mathrm{var}_\theta(T_n)]^2$

(C) $(bias)^2 + [\mathrm{var}_\theta(T_n)]^2$

(D) $(bias)^2 + \mathrm{var}_\theta(T_n)$

54. Rao- Blackwell theorem enables us to obtain minimum variance unbiased estimator through

(A) Unbiased estimators
(B) Complete statistics

(C) Efficient statistics
(D
) Sufficient statistics

55. If t is a consistent estimator of θ, then

(A) t is also a consistent estimator of θ^2

(B) t^2 is also a consistent estimator of θ

(C) t^2 is also a consistent estimator of θ^2

(D) None of the above

56. Formula for the confidence interval for the ratio of variances of two normal population involves

(A) χ^2 - distribution

(B) F distribution

(C) t-distribution

(D) None of the above

57. For the distribution $f(x,\theta)=\frac{1}{\theta}; 0 \le x \le \theta$ a sufficient estimator for θ based on a sample $X_1, X_2, \ldots\ldots X_n$ is

(A) $\sum X_i / n$

(B) $\sqrt{\sum X_i^2}$

(C) max($X_1, X_2, \ldots\ldots X_n$)

(D) min($X_1, X_2, \ldots\ldots X_n$)

58. A confidence interval of confidence coefficient $(1-\alpha)$ is best which has

(A) Smallest width
(B) Vastest width
(C) Upper and lower limits equidistant from the parameter
(D) One-sided confidence interval

59. If the variance of an estimator attains the Crammer-Rao lower bound, the estimator is

(A) Most efficient
(B) Sufficient
(C) Consistent
(D) Admissible

60. Power of a test is related to

(A) type I error
(B) type II error
(C) type I and II errors both
(D) None of the above

61. A test based on a test statistic is classified as

(A) Randomised test
(B) Non-randomised test
(C) Sequential test
(D) Bayes test

62. Neyman-Pearson lemma provides

(A) An unbiased test
(B) A most powerful test
(C) An admissible test
(D) Minimax test

63. Equality of several normal population means can be tested by

(A) Bartlett's test

(B) F-test

(C) χ^2-test

(D) t-test

64. If $Var(X+Y) = Var(X-Y)$, then the correlation between X and Y is equal to

(A) 1

(B) 1/2

(C) 1/4

(D) 0

65. If one regression coefficient of the two regression lines is greater than unity, the other will be

(A) > 1

(B) 1

(C) < 1

(D) 1/2

66. If for two attributes A and B the relation $(\alpha\beta) = \frac{(\alpha)(\beta)}{N}$ holds. the attributes (α) and (β) are

(A) Independent
(B) Positively associated
(C) Negatively associated
(D) No conclusion

67. The c.d.f of a random variable X is

$$F(x) = \begin{cases} 0 & x \le 0 \\ \frac{x}{2\pi} & 0 < x \le 2\pi \\ 1 & x > 2\pi \end{cases}$$

Then $P\left(\frac{\pi}{4} \leq X \leq \frac{\pi}{2}\right)$ is equal to

(A) 1/4

(B) 1/8

(C) 1/3

(D) 1/5

68. The Gamma distribution is

(A) Positively skewed and leptokurtic
(B) Negatively skewed and leptokurtic
(C) Positively skewed and mesokurtic
(D) Negatively skewed and mesokurtic

69. If X follows exponential distribution with parameter θ, then $Y = e^{-\theta X}$ follow

(A) Gamma distribution
(B) Uniform distribution
(C) Beta distribution
(D) Cauchy distribution

70. Let $X_1, X_2, \ldots, X_n$ be a random sample from $B(1, p)$, then the consistent estimator of $p(1-p)$ is

(A) $\overline{X}$

(B) $\overline{X}^2$

(C) $\overline{X}(1-\overline{X})$

(D) $n.\overline{X}$

71. If a sequence of random variables is convergent in probability then as $\to \infty$, $P(|X_n - X| < \varepsilon)$ tends to

(A) 1

(B) 0

(C) ∞

(D) $-\infty$

72. Define the events for a single roll of a die:
$A = \{1, 3, 5\}$; $B = \{2, 4, 6\}$; $C = \{5, 6\}$. Then

(A) A and B are disjoint but not independent
(B) A and B are not disjoint but independent
(C) A and B are disjoint and independent
(D) A and B are not disjoint and not independent

73. Given that $P(A \cup B) = 5/6$, $P(A \cap B) = 1/3$ and $P(\acute{B}) = ½$.
Then the events A and B are

(A) Dependent
(B) Independent
(C) Mutually Exclusive
(D) Conditional events

74. If σ_1^2 is the error variance of design D_1 and σ_2^2 is the error variance of design D_2 utilizing the same experimental material, the efficiency of D_1 over D_2 is

(A) $\dfrac{\frac{1}{\sigma_1^2}}{\frac{1}{\sigma_2^2}}$

(B) $\dfrac{\frac{1}{\sigma_2^2}}{\frac{1}{\sigma_1^2}}$

(C) $\sigma_1^2\sigma_2^2$

(D) $\dfrac{1}{\sigma_1^2\sigma_2^2}$

75. A random variable X takes values 0, 1, 2, 3, ... with probability proportional to $(x+1)\left(\frac{1}{5}\right)^x$. Then $P(X \leq 1)$ is equal to

(A) 112/125
(B) 110/125
(C) 113/125
(D) 109/125

76. If $e^x + e^y = e^{x+y}$, then $\dfrac{dy}{dx}$ is

(A) $\dfrac{e^x\left(e^y-1\right)}{e^y\left(e^x-1\right)}$

(B) $\dfrac{e^y\left(e^y-1\right)}{e^x\left(e^x-1\right)}$

(C) $\dfrac{e^y\left(e^x-1\right)}{e^x\left(e^y-1\right)}$

(D
) $\frac{e^x(1-e^y)}{e^y(e^x-1)}$

77. Let $F(x, y)$ be the joint p.d.f. of (X, Y). If a, b, c, d are any real numbers with $a < b$ and $c < d$, then $P[a < X \leq b, c < Y \leq d]$ is equal to

(A) $F(b, d) + F(a, c) - F(b, c) + F(a, d)$
(B) $F(b, d) + F(a, c) + F(b, c) + F(a, d)$
(C) $F(b, d) - F(a, c) - F(b, c) + F(a, d)$
(D) $F(b, d) + F(a, c) - F(b, c) - F(a, d)$

78. A discrete r.v. X assumes three values $-3, 0, 4$ and $P(X = 0) = ½$ and $E(X) = 9/8$. Then $P(X =$ [illegible]$)$ is

(A) 1/8
(B) 2/8
(C) 3/8
(D) 1/2

79. A sample study of the people of an area revealed that total number of women was 40% and the percentage of coffee drinkers were 45 as a whole and the percentage of male coffee drinkers was 20. The percentage of female non-coffee drinkers is

(A) 10
(B) 15
(C) 1[illegible]
(D) 20

80. The arithmetic and geometric mean of two observations are 5 and 4 respectively. Then the observations are

(A) 2, 8
(B) 4, 1
(C) 6, 4
(D) 3, 7

81. The Harmonic mean of 1, 1/2, 1/3, ..., $1/n$ is

(A) n
(B) $2n$
(C) $2/(n + 1)$
(D) $n(n + 1)/2$

82. If arithmetic mean and coefficient of variation of x are 20 and 20 respectively, what is the variance of $y = 10 - 2x$?

(A) 64
(B) 16
(C) 36
(D) 84

83. If the range of X is 2, what is the range of $-3X + 50$?

(A) 2
(B) -6
(C) 44
(D) +6

84. Let X be a r.v. with cumulative distribution function (c.d.f.) $F(x)$. Which one of the following is not the property of c.d.f.?

(A) Bounded function
(B) F is monotonically non decreasing
(C) Point function
(D) Right continuous

85. 3^2 factorial experiment means an experiment with

(A) 2 factors at 3 levels
(B) 3 factors at 2 levels
(C) 3 factors at 3 levels
(D) 2 factors at 2 levels

86. Let $X \sim$ Binomial (2, 1/2) and $Y = X^2$. Then $E(Y)$ is

(A) 2

)
(B) 3/2
(C) 4
(D 1/9
)

87. To compare several treatments, when the experimental units are homogeneous, the appropriate design to be used is

(A) Randomized Block Design
(B) Latin Square Design
(C) Split Plot Design
(D) Completely Randomized Design

88. A random variable X has mean 50 and variance 100. By using Chebychev's inequality, the upper bound for $P\left[|X-50|\geq 15\right]$ is

(A) $3/4$
(B) $2/9$
(C) $1/9$
(D) $4/9$

89. If $y=\sqrt{\sin x+\sqrt{\sin x+\sqrt{\sin x \ldots}}}$, then $\frac{dy}{dx}$ is

(A) $\frac{\cos x}{2y-1}$
(B) $\frac{\sin x}{2y-1}$
(C) $\frac{\cos x}{y-1}$
(D) $\frac{\sin x}{y-1}$

90. If $x\sqrt{1+y}+y\sqrt{1+x}=0$, then $\frac{dy}{dx}$ is

(A) $\frac{-1}{1+x}$
(B) $\frac{-1}{1+y}$
(C) $\frac{-1}{(1+x)^2}$
(D) $\frac{-1}{(1+y)^2}$

91. Two contrasts $c_i^T \hat{\beta}$ and $c_j^T \hat{\beta}$ are said to be orthogonal if

(A) $c_i^T c_j = 1$
(B) $c_i^T c_j = 0$
(C) $c_i^2 = 1$
(D) $c_j^2 = 0$

92. Given the two line of regression as, $3X - 4Y + 8 = 0$ and $4X - 3Y = 1$, the means of X and Y are

(A) $\overline{X} = 4, \overline{Y} = 5$

(B) $\overline{X} = 3, \overline{Y} = 4$

(C) $\overline{X} = 4/3, \overline{Y} = 5/4$

(D) $\overline{X} = 3/4, \overline{Y} = 4/5$

93. If X and Y are independent with common Exponential distribution with parameter $\theta = 1$, then the distribution of $(X - Y)$ is

(A) A Standard Cauchy distribution
(B) An Exponential distribution
(C) A Standard Laplace distribution
(D) A Standard Normal distribution

94. The producer's risk is

(A) Probability of rejecting a good lot
(B) Probability of accepting a good lot
(C) Probability of rejecting a bad lot
(D) Probability of accepting a bad lot

95. The probability density function of X is $f(x)=\begin{cases}\frac{1}{4}, \wedge |x|<2 \\ 0\, otherwise\end{cases}$.

Then $P(2X+3>5)$ is equal to

(A) 1/3
(B) 1/2
(C) 1/7
(D) 1/4

96. Let $\{X_n\}$ be a sequence of random variables. X_n converges almost surely to X if and only if

(A) $P\left(\lim_{n\to\infty} X_n = X\right)=0$
(B) $P\left(\lim_{n\to\infty} X_n \neq X\right)=a\,;0<a<1$
(C) $P\left(\lim_{n\to\infty} X_n \neq X\right)=1$
(D) $P\left(\lim_{n\to\infty} X_n = X\right)=1$

97. The relation between almost sure convergence (a.s), convergence in probability (p) and convergence in r^{th} mean (m) is

(A) a.s $\Longrightarrow m \Longrightarrow p$
(B) $m \Longrightarrow$ a.s $\Longrightarrow p$
(C) a.s $\Longrightarrow p$; $m \Longrightarrow p$
(D) a.s $\Longrightarrow p$; $p \Longrightarrow m$

98. If Type-I and Type-II errors are kept fixed, then the power of the test increases,

(A) if there is an increase of sample size
(B) if sample size remains unchanged
(C) if there is a decrease of sample size
(D) if the test is unbiased

99. A valid t-test to assess an observed difference between two sample mean value requires

(i) Both populations are independent
(ii) The observations to be sampled from normally distributed parent population
(iii) The variance to be the same for both populations

(A) (i) and (ii)
(B) (ii) and (iii)
(C) (i) and (iii)
(D) All the three conditions

100. A sufficient condition for an estimator T_n to be consistent for θ is that

(A) Var $(T_n) \to 0$ as $n \to \infty$
(B) $E(T_n) \to 0$ as $n \to \infty$
(C) Var $(T_n)/E(T_n) \to 0$ as $n \to \infty$
(D) $E(T_n) \to \theta$ and Var $(T_n) \to 0$ as $n \to \infty$

101. The arithmetic mean of three sizes 3, 4 and 2.5 weighed respectively by the numbers 15, 5 and x is found to be 3. The value of x is

(A) 7
(B) 9
(C) 10
(D) 8

102. $\lim\limits_{x \to 4} \dfrac{x^2 - x - 12}{x - 4}$ is

(A) 0

(B) ∞
(C) 3
(D) 7

103. The characteristics function of standard Cauchy distribution is

(A) e^{-t}
(B) e^{t}
(C) $e^{-|t|}$
(D) $e^{|t|}$

104. A design is said to be orthogonal if

(A) Treatment contrasts are correlated with block contrast
(B) Treatment contrasts are uncorrelated
(C) Block contrasts are correlated
(D) Treatment contrasts are uncorrelated with block contrast

105. Let X_1 and X_2 are two independent standard normal variates.

Then the distribution of $(X_2 - X_1)^2/2$ is

(A) $\chi^2(1)$

(B) N(0, 1)

(C) $F_{(1,2)}$

(D) $t_{(2)}$

106. An unbiased coin is tossed twice. Let X and Y denote the number of times a head turns up and the number of times a tail turns up respectively. Pick out the wrong statement from the alternatives given below

(A) $P(X > Y) > P(X < Y)$

(B) $P(X + Y = 2) = 1$

(C) $P(X = 0) = P(Y = 0)$

(D) $P(X = Y) = 1/2$

107. Let $X_1, X_2, \ldots, X_n$ be a random sample from $N(\mu, \sigma^2)$ distribution, μ and σ^2 both are unknown. Define $S^2 = \sum_{i=1}^{n} \left(x_{(i)} - \bar{x} \right)^2$. Which one is not a statistic?

(A) $\sum_{i=1}^{n} \left(x_i - \mu \right)^2$

(B) $\sum_{i=1}^{n} \left(x_i - \bar{x} \right)^2 / n$

(C) $\sum_{i=1}^{n} \left(x_i - S \right)^2 / n$

(D) $\bar{x}/S^2$

108. Let $X_1, X_2, \ldots X_{11}$ be a random sample from a normal distribution having the variance 4. Let $\bar{X} = \dfrac{\sum_{i=1}^{11} X_i}{11}$ and $S = \sum_{i=1}^{11} (X_i - \bar{X})^2$. Then the value of E(S) is

(A) 22
(B) 44
(C) 25
(D) 40

109. If the regression line of Y on X is Y = 23 – 2.0X and the coefficient of determination is 0.49, the coefficient of correlation is

(A) 0.49
(B) 0.70
(C) -0.70
(D) -0.49

110. If the $P(X = x) = 1/3$, if x = 0 and $P(X = x) = 2/3$, if x = 1, what will be the $P[X(X - 1) = 1]$?

(A) 0
(B) 1
(C) 1/2
(D) 2/3

111. If a statistic t follows Student's t distribution with digress of freedom n, then t^2 follows

(A) Student's t-distribution with n^2 degrees of freedom

(B) Snedecor's F-distribution with (1, n) degrees of freedom
(C) Snedecor's F-distribution with (n, 1) degrees of freedom
(D) None of the above

112. The number of non-negative variables in a basic feasible solution to a $m \times n$ transportation problem is:

(A) mn
(B) m+n
(C) m+n+1
(D) None of the above

113. Which of the following statements about confidence intervals is INCORRECT?

(A) If we keep the sample size fixed, the confidence interval gets wider as we increase the confidence coefficient

(B) A confidence interval for a mean always contains the sample mean

(C) If we keep the confidence coefficient fixed, the confidence interval gets narrower as we increase the sample size

(D) If the population standard deviation increases, the confidence interval decreases in width

114. If a primal LP problem has a finite solution, then the dual LP problem should have

(A) finite solution

(B) infeasible solution

(C) unbounded solution

(D) None of the above

115. The dual of the primal maximization LP problem having *m* constraints and *n* non-negative variables should

(A) have *n* constraints and *m* non-negative variables
(B) be a minimization LP problem
(C) both (A) and (B)
(D) None of the above

116. Consider the statements:

I. Maximum likelihood estimators are always unbiased.

II. Maximum likelihood estimators are always unique.

Which of the statements given above is/are correct?

(A) I only
(B) II only
(C) Both I and II
(D) Neither I nor II

117. Suppose X is a random variable taking values +1 and -1 only with probability c/3 and c/6 respectively. Let $Y = X^2$. Then

(A) c=1 and P(Y=0)=1
(B) c=1 and P(Y=1)=1
(C) c=2 and P(Y=1)=1
(D) c=2 and P(Y=0)=1

118. A sampling technique in which only the first unit is selected with the help of random numbers and the rest get selected automatically according to some pre-designed pattern is known as

(A) stratified random sampling

(B) multi-stage sampling
(C) cluster sampling
(D) systematic sampling

119. Normal distribution is also known as

(A) Gaussian distribution
(B) Poisson distribution
(C) Bernoulli's distribution
(D) Weighted average distribution

120. In Poisson probability distribution, if value of ✦ is integer, then distribution will be

(A) bimodal
(B) unimodal
(C) positive modal
(D) negative modal

121. Method in which previously calculated probabilities are revised with new probabilities using other available information is based on

(A) updating theorem
(B) revised theorem
(C) Bayes theorem
(D) dependency theorem

122. If two events X and Y are considered as partially overlapping events, then rule of addition can be written as

(A) P(X or Y) = P(X) – P(Y) + P(X and Y)
(B) P(X or Y) = P(X) + P(Y) * P(X – Y)
(C) P(X or Y) = P(X) * P(Y) + P(X – Y)
(D) P(X or Y) = P(X) + P(Y) – P(X and Y)

123. If $\lim_{n \to \infty}\left(1+\frac{1}{n}\right)^{n} = e,$ then the value of e is

(A) 2.71828
(B) 2.81928
(C) 2.91728
(D) 2.71928

124. The polynomial equation of the least degree having -1, 1, 2 and 3 as roots is

(A) $x^4 - 5x^3 + 5x - 6 = 0$

(B) $x^4 - 5x^3 + 5x^2 + 5x - 5 = 0$

(C) $x^4 - 5x^3 + 5x^2 + 5x - 6 = 0$

(D) $x^4 - 5x^3 - 5x^2 + 5x - 6 = 0$

125. A complex square matrix (a_{ij}) is said to be Hermitian matrix if (for all i and j)

(A) $a_{ij} = a'_{ij}$

(B) $a_{ij} = \overline{a_{ij}}$

(C) $a_{ij} = \overline{a_{ji}}$

(D) $a_{ij} = a_{ji}$

126. If A is orthogonal, then $|A|$ is

(A) +1

(B) - 1

(C) ± 1

(D) 0

127. $\int_0^2 \int_0^2 dx\,dy$ is equal to

(A) 2
(B) 0
(C) 1
(D) 4

128. $\Gamma(n+1)$ is equal to

(A) $n!$

(B) $(n+1)!$

(C) Γn

(D) $(n-1)!$

129. Histogram can be used only when

(A) Class intervals are equal or unequal
(B) Class intervals are all equal
(C) Class intervals are unequal
(D) Frequencies in class interval are equal

130. If (X, Y) follows the bivariate N(0,0,1,1,ρ), then the variables X + Y and X – Y are

(A) Correlated with ρ= ½
(B) Independently distributed
(C) Negatively correlated
(D) None of the above

131. Bias of an estimator can be

(A) Positive
(B) Negative
(C) Either positive or negative
(D) Always zero

132. Range of the variance ratio F is

(A) -1 to 1
(B) $-\infty$ to ∞
(C) 0 to ∞
(D) 0 to 1

133. If each value X is divided by 2 and Y is multiplied by 2, then b'_{YX} by coded values is

(A) Same as b_{YX}

(B) Twice of b_{YX}

(C) Four times of b_{YX}

(D) Eight times of b_{YX}

134. If the index number is independent of the units of measurement, then it satisfies

(A) Time reversal test
(B) Factor reversal test
(C) Unit test
(D) All of the above

135. Variation due to assignable causes in the product occurs due to

(A) Faulty process
(B) Carelessness of operators
(C) Poor quality of raw material
(D) All of the above

136. Missing observation in a CRD is to be

(A) Estimated
(B) Deleted
(C) Guessed
(D) None of the above

137. If two events A and B are such that $A \subset B$ and $B \subset A$, the relation between $P(A)$ and $P(B)$ is

(A) $P(A) \leq P(B)$

(B) $P(A) \geq P(B)$

(C) $P(A) = P(B)$

(D) None of the above

138. The moment generating function of the Bernoulli distribution is

(A) $(q + pe^{t})^{n}$

(B) $(q + pe^{t})^{-n}$

(C) $(q + pe^{t})$

(D) $(q + pe^{-t})$

139. The degrees of freedom for students- t based on a random sample of size n is

(A) $n-1$

(B) n

(C) $(n-2)$

(D) $\frac{n-1}{2}$

140. If $X \sim b(n, p_1)$ and $X_2 \sim b(n_2, p_2)$, the sum of the variates $(X_1 + X_2)$ is distributed as

(A) Hypergeometric distribution
(B) Binomial distribution
(C) Poisson distribution
(D) None of the above

141. Let $X \sim N(\mu, \sigma^2)$. Then the central moments of odd order are

(A) One
(B) Zero
(C) Infinite
(D) Positive

142. If we have a sample size n from a population of N units, the finite population correction is

(A) $\frac{N-1}{N}$

(B) $\frac{n-1}{N}$

(C) $\frac{N-n}{N}$

(D) $\frac{N+n}{n}$

143. For a random sample from a Poisson population $P(\lambda)$, the maximum likelihood estimate of λ is

(A) Median
(B) Mode
(C) Geometric mean

(D) Mean

144. Analysis of variance utilizes

(A) F-test

(B) χ^2-test

(C) Z-test

(D) t-test

145. If $Var(X+Y) = Var(X) + Var(Y)$, then the value of correlation coefficient r_{XY} is

(A) 0

(B) 1

(C) - 1

(D) 0.5

146. If X is Uniform over (a, b) and if (α, β) is a sub interval of (a, b), then $P(\alpha < X < \beta)$ is equal to

(A) $\frac{\beta - \alpha}{b - a}$

(B) $\frac{\alpha - \beta}{b - a}$

(C) $\frac{\alpha - \beta}{(b - a)^2}$

(D) $\frac{\alpha + \beta}{(a - b)^2}$

147. Let X be a random variable (r.v.). Then $Y = 1/X$ is also a

(A) Random variable
(B) Random variable provided $P(X = 0) = 0$
(C) Random variable provided $P(X = 0) = 1$
(D) Not a Random variable

148. If the values of the 1st and 3rd quartiles are 20 and 30 respectively, then the value of inter quartile range is

(A) 10
(B) 25
(C) 5
(D) 0

149. Let $\{A_n\}$ be a sequence of independent events, P, if

(A) $\sum P(A_n) < \infty$
(B) $\sum P(A_n) = \infty$
(C) $\sum P(A_n) = 1$
(D) $\sum P(A_n) < 1$

150. If T_n is unbiased and consistent for θ, then

(A) T_n^2 is unbiased and consistent for θ^2
(B) T_n^2 is unbiased but not consistent for θ^2
(C) T_n^2 is biased but consistent for θ^2
(D) T_n^2 is biased and not consistent for θ^2

STATISTICS - ANSWER KEY									
TEST CODE: 614									
QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY	QN. NO.	KEY
1	C	26	D	51	B	76	A	101	C
2	C	27	C	52	B	77	B	102	D
3	C	28	C	53	D	78	C	103	C
4	D	29	B	54	D	79	B	104	D
5	B	30	C	55	C	80	A	105	A
6	C	31	D	56	B	81	C	106	A
7	A	32	B	57	C	82	A	107	A
8	A	33	C	58	A	83	D	108	D
9	D	34	C	59	A	84	C	109	C
10	B	35	D	60	B	85	A	110	A
11	B	36	B	61	B	86	B	111	B
12	C	37	A	62	B	87	D	112	D
13	C	38	A	63	B	88	D	113	D
14	B	39	A	64	D	89	A	114	A
15	B	40	B	65	C	90	C	115	C
16	C	41	C	66	A	91	B	116	D
17	B	42	A	67	B	92	A	117	C
18	D	43	C	68	A	93	C	118	D
19	B	44	D	69	B	94	A	119	A
20	C	45	B	70	C	95	D	120	A
21	C	46	B	71	A	96	C	121	C
22	D	47	B	72	A	97	C	122	D
23	A	48	B	73	B	98	A	123	A
24	C	49	C	74	A	99	D	124	C
25	D	50	A	75	A	100	D	125	C

QN. NO.	KEY
126	C
127	D
128	A
129	B
130	B
131	C
132	C
133	C
134	C
135	D
136	B
137	C
138	C
139	A
140	B
141	B
142	C
143	D
144	A
145	A
146	A
147	B
148	C
149	A
150	C