STATISTICS
(Final)

1. If $A=\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$, where $i^2=-1$, then A^2 is

   (A) 1 (B) $-A$
   (C) 0 (D) A

2. The rank of an $m \times n$ matrix is

   (A) m (B) n
   (C) $\max\{m,n\}$ (D) $\min\{m,n\}$

3. $\lim\limits_{x\to\infty} \dfrac{x^2}{e^x}$ is

   (A) 1 (B) ∞
   (C) 0 (D) -1

4. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x\sin x \, dx$ is

   (A) 2 (B) 0
   (C) 1 (D) ∞

5. If $f(x)=|x|$, then $f(x)$ has

   (A) maximum at $x=0$
   (B) minimum at $x=0$
   (C) neither maximum nor minimum at $x=0$
   (D) minimum at $x=1$

6. The curve which is used to measure income inequality is

   (A) Pie chart (B) Line graph
   (C) Frequency curve (D) Lorenz curve

7. Which one of the following is true?

   (A) The sum of the deviations of the observations from the median is zero.
   (B) The sum of the deviations of the observations from the mode zero.
   (C) The sum of the deviations of the observations from the harmonic mean is zero.
   (D) The sum of the deviations of the observations from the arithmetic mean is zero

8. The weighted mean of the first n natural numbers, the weight being the numbers themselves, is

(A) $\frac{n+1}{2}$ (B) $\frac{2n+1}{3}$

(C) $\frac{2n+1}{6}$ (D) $\frac{(n+1)^2}{2}$

9. The median of n observations is M. Each of these n observations is multiplied by a and subtracted by b. Then the median of the new set of observations is

(A) aM (B) a^2M

(C) $aM+b$ (D) $aM-b$

10. With the usual notations, the coefficient of variation n observations is $\frac{\sigma}{\bar{x}}$. Each of these n observations is multiplied by a. Then the coefficient of variation of the new set of observations is

(A) $\frac{\sigma}{\bar{x}}$ (B) $\frac{a\sigma}{\bar{x}}$

(C) $\frac{\sigma}{a\bar{x}}$ (D) $a+\frac{\sigma}{\bar{x}}$

11. In a uni-modal distribution, the mean is smaller than the mode. The distribution is

(A) positively skewed (B) negatively skewed

(C) symmetrical (D) None of the above

12. To fit a third degree polynomial, the number of normal equations required is

(A) 4 (B) 3

(C) 2 (D) 5

13. Events A and B are such that $P(A)=\frac{2}{3}$, $P(B)=\frac{3}{8}$ and $P(A\cap B)=\frac{1}{4}$. Then $P(A^C\cap B^C)$ is

(A) $\frac{19}{24}$ (B) $\frac{6}{24}$

(C) $\frac{7}{12}$ (D) $\frac{5}{24}$

14. Let f be the probability density function given by

$$f(x)=\begin{cases} kx^2, & 0 \le x \le 2 \\ 0 & \text{otherwise} \end{cases}$$

The value of k is given by

(A) $\frac{1}{8}$ (B) $\frac{3}{8}$

(C) $\frac{2}{5}$ (D) None of the above

15. Let $P_1 = P(A)$, $P_2 = P(B)$, $P_3 = P(A \cap B)$, then $P(A/B)$ is

(A) $\frac{P_3}{P_2}$ (B) $\frac{P_2}{P_3}$

(C) $P_3 P_2$ (D) $P_1 P_2$

16. The distribution for which the moments do not exist is

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

17. From the following distributions which one has memory less property?

(A) Binomial distribution (B) Exponential distribution
(C) Hyper geometric distribution (D) Normal distribution

18. If X is a continuous random variable then for all x, $P(X = x)$

(A) 0 (B) 1

(C) Any value between 0 and 1 (D) $\frac{1}{2}$

19. If the probability that an applicant for a driver's license will pass the test on any given trial is 0.8, what is the probability that he will finally pass the test on the fourth trial.

(A) 0.0034 (B) 0.0064
(C) 0.0089 (D) None of the above

20. Let X and Y are independent uniform random variables on $[0,1]$. Consider the following statements.

(i) $E(X+Y)=1$

(ii) $V(X+Y)=\frac{1}{6}$

(A) Both (i) and (ii) are true
(B) (i) is true but (ii) is not
(C) (ii) is true but (i) is not
(D) Neither of them is true

21. The geometric mean of the two regression coefficients b_{xy} and b_{yx} is

(A) the correlation coefficient
(B) coefficient of determination
(C) coefficient of skewness
(D) coefficient of variation

22. Which one of the following probability distributions is not possible?

(A) Poisson distribution with mean 2 and variance 2.
(B) Binomial distribution with mean 16 and standard deviation 4.
(C) Binomial distribution with mean 4 and standard deviation $\sqrt{3}$.
(D) Gamma distribution with mean -4 and variance 3.

23. If $X_1, X_2, ..., X_n$ is a random sample from $U(0,\theta)$, then the MLE of θ is

(A) the sample mean
(B) the sample median
(C) first order statistic
(D) n^{th} order statistic

24. If $X_1, X_2, ..., X_n$ is a random sample from population with pdf $f(x)=e^{-(x-\theta)} x>\theta,\ \theta>0$. Then the MLE of θ is

(A) the sample mean
(B) the sample standard deviation
(C) first order statistic
(D) n^{th} order statistic

25. The lower bound for the variance of an unbiased estimator is given by

(A) Rao Blackwell theorem
(B) Neyman Fisher Factorization theorem
(C) Cramer-Rao theorem
(D) Rolle's theorem

26. If $X_1, X_2, ..., X_n$ is a random sample from $N(\mu,1)$ population. Then one of the following statements is incorrect

(A) $(X_1, X_2, ..., X_n)$ is a sufficient statistic.
(B) $\bar{X}$ is a sufficient statistic.
(C) $X_1 + X_2 + ... + X_n$ is a sufficient statistic.
(D) $X_2 + ... + X_n$ is a sufficient statistic.

27. Invariance property of estimators is possessed by

(A) maximum likelihood estimators.
(B) method of moments estimators.
(C) least squares estimators.
(D) unbiased estimators.

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

(A) 1 (B) 0
(C) ∞ (D) $-\infty$

29. Let the random variable X have probability density function

$$f(x) = \begin{cases} \frac{1}{2\sqrt{3}}; & -\sqrt{3} < x < \sqrt{3} \\ 0; & \textit{elsewhere} \end{cases}$$

By Chebyshev's inequality, the upper bound for $P\{|X| \geq 3/2\}$ is

(A) $1 - \sqrt{3/2}$ (B) $\sqrt{3/2}$
(C) $1/2$ (D) $4/9$

30. If T_n is unbiased and consistent estimator for θ, then which one of the following correct?

(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

31. Let the joint density of (X,Y) be $f(x,y)=\begin{cases}24xy;\ x>0,\ y>0,\ x+y\le 1\\ 0 \text{ otherwise}\end{cases}$, then the conditional density of Y given $X=x$ is

(A) $\dfrac{2y}{(1-x)^2};\ 0<y<1-x$ (B) $\dfrac{2y}{(1-x)^2};\ 0<y<1+x$

(C) $\dfrac{(1-x)^2}{2y};\ 0<y<1$ (D) $\dfrac{(1-x)^2}{2y};\ 0<x<1$

32. The mean and variance of a Binomial distribution are 8 and 4 respectively. The $P(X=1)$ is equal to

(A) $1/2^{12}$ (B) $1/2^4$

(C) $1/2^6$ (D) $1/2^8$

33. If A and B are two independent events both having probability 'p' and $P(A\cup B)=\alpha$, then the value of 'p' is

(A) $\sqrt{1-\alpha}$ (B) $\sqrt{\alpha-1}$

(C) $1-\sqrt{1-\alpha}$ (D) $\sqrt{1-\alpha}-1$

34. The characterisitic function of standard Cauchy distribution is

(A) e^{-t} (B) e^{t}

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

35. If two independent random variables X,Y are binomially distributed, respectively with $n=3,\ p=1/3$ and $n=5,\ p=1/3$, then $P(X+Y\ge 1)$ is

(A) $1-(2/3)^8$ (B) $(2/3)^8$

(C) $(1/3)^8$ (D) $1-(1/3)^8$

36. The probability density function of Normal distribution is

$f(x)=\dfrac{2\sqrt{2}}{\sqrt{\pi}}e^{-2(2x-1)^2};\ -\infty<x<\infty$

Then the means and variance are

(A) $(1/2,\ 1/16)$ (B) $(1/16,\ 1/2)$

(C) $(1/3,\ 1/5)$ (D) $(1/5,\ 1/3)$

37. A linear combination $\sum_{i=1}^{k} c_i a_i$ is a contrast if

(A) $\sum_{i=1}^{k} c_i = 1$ (B) $\sum_{i=1}^{k} a_i = 1$

(C) $\sum_{i=1}^{k} c_i = 0$ (D) $\sum_{i=1}^{k} a_i = 0$

38. The condition for the time reversal test to hold good, with usual notations, is

(A) $P_{01} \times P_{10} = 1$ (B) $P_{01} \times P_{10} = 0$

(C) $P_{01} / P_{10} = 1$ (D) $P_{01} + P_{10} = 1$

39. 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) $\dfrac{1}{\sigma_1^2 \sigma_2^2}$

40. If X is a random variable such that $E(X) = 3$, $E(X^2) = 13$, then $P[-2 < X < 8]$ is greater than or equal to

(A) 21/25 (B) 4/25

(C) 1/25 (D) 2/25

41. If $[62, 75]$ is the 05% confidence interval for the mean of a population based on 10 observations, then to test H : Mean = m against K : Mean ≠ m, the correct testing procedure is

(A) reject H if $m \in [62, 75]$

(B) reject H if m lies outside the interval $[62, 75]$

(C) reject H if $m < 62$

(D) reject H if $m > 75$

42. Let $X_1, X_2, \ldots\ldots X_n$ be a random sample from a Bernoulli population $\theta^x (1-\theta)^{1-x}$. A sufficient statistics for θ is

(A) $\sum x_i$ (B) $\prod x_i$

(C) Max.$(x_1, x_2, \ldots\ldots, x_n)$ (D) Min.$(x_1, x_2, \ldots\ldots, x_n)$

43. For a group containing 100 observations, the arithmetic mean and the standard deviation are 8 and $\sqrt{10.5}$ respectively. For 50 observations selected from these 100 observations, the mean and standard deviation are 10 and 2 respectively. Then mean and standard deviation for the other half is

(A) 6, 2 (B) 6, 4
(C) 6, 3 (D) 5, 2

44. The value of λ for which the equations
$x+(\lambda+4)y+(4\lambda+2)z=0$
$x+2(\lambda+1)y+(3\lambda+4)z=0$
$2x+3\lambda y+(3\lambda+4)z=0$
have non-trivial solution are

(A) ± 2 (B) 0
(C) $1\pm i$ (D) i

45. For the equation $|x^2|+|x|-6=0$, the roots are

(A) one and only one real number (B) real with sum one
(C) real with sum zero (D) real with product zero

46. If the sum of the roots of a quadratic equation is -1 and the product is -12, then the quadratic equation is

(A) $x^2-7x+12=0$ (B) $x^2+x-12=0$
(C) $x^2+x+12=0$ (D) $x^2-7x=0$

47. Critical region of size α which minimize β amongst all critical regions of size α is called

(A) powerful critical region (B) minimum critical region
(C) best critical region (D) worst critical region

48. The maximum possible number of orthogonal contrasts among four treatments is

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

49. Which one of the following yield the valid parameters of Binomial distribution?

(A) $np=8,\ npq=4$ (B) $n=16,\ p=3/2$
(C) $n=4,\ p=q=1/4$ (D) $np=10,\ npq=20.5$

50. If $\frac{x+1}{(x-a)(x-3)} = \frac{2}{(x-a)} + \frac{b}{(x-3)}$, then the value of (a,b)

(A) $(7,-1)$ (B) $(-4,1)$
(C) $(4,1)$ (D) $(-4,-1)$

51. If for two attributes A and B, N = 140, (A) = 100, (B) = 105 and (AB) = 25, the attributes A and B are

(A) dependent (B) positively associated
(C) negatively associated (D) independent

52. The basic feasible solution of an LPP is degenerate if

(A) all the basic variables have positive value.
(B) all the basic variables have negative value
(C) one of more basic variables vanish.
(D) All of the above

53. In a normal distribution, the percentage of values lying between -2σ and $+2\sigma$ is

(A) 68% (B) 99.7%
(C) 95.4% (D) 100%

54. Let $y = \sqrt{u},\ u = v^3 + 1,\ v = \sin x,$ then $\frac{dy}{dx} =$

(A) $\frac{3}{2}\sin x \cos x$ (B) $\frac{3\sin^2 x \cos x}{2\sqrt{\sin^3 x + 1}}$
(C) $\frac{3\sin x \cos x}{2\sqrt{\sin^4 x + 1}}$ (D) $\frac{3}{2}\frac{\cos x}{\sqrt{\sin^3 x + 1}}$

55. The method used for solving an assignment problem is

(A) MODE method (B) reduced matrix method
(C) Hungarian method (D) stepping stone method

56. The Vogel's Approximation Method (VAM) gives

(A) an optimal solution to the transportation problem.
(B) alternative solution of a transportation problem.
(C) the maximum solution to a transportation problem.
(D) a basic feasible solution which must be tested for optimality.

57. The value of determinant remain unchanged if

(A) columns are transformed into rows and rows into columns.
(B) two rows of a determinant are interchanged.
(C) each element in arrow is multiplied by a constant.
(D) All of the above

58. A saddle point in game theory is

(A) the highest value in the payoff matrix.
(B) the lowest value in the payoff matrix.
(C) the minimax value of the rows and the maximin value of the columns.
(D) the minimum value in the row and the maximum value of the column in which is lies.

59. The probability of getting two heads in two successive tosses of a fair coin is

(A) 0.25 (B) 0.50
(C) 0.75 (D) 1.00

60. The inverse of the matrix $A=\begin{bmatrix}7 & 3\\ 2 & 1\end{bmatrix}$ is

(A) $\begin{bmatrix}1 & -3\\ -2 & 7\end{bmatrix}$ (B) $\begin{bmatrix}1 & -3\\ 2 & 1\end{bmatrix}$

(C) $\begin{bmatrix}1 & 3\\ -2 & 1`\end{bmatrix}$ (D) $\begin{bmatrix}1 & 3\\ 2 & -1\end{bmatrix}$

61. Let $X_1, X_2, ...X_n$ be a random sample from a distribution with density

$$f(x,\ \theta)=\begin{cases}\theta.e^{-\theta x}; x>0; \theta>0\\ \text{otherwise}\end{cases}$$

the moment estimator of θ is

(A) $\sum X_i / n$ (B) sample median
(C) $n/\sum X_i$ (D) $\left(\sum X_i\right)^{\frac{1}{n}}$

62. Let $X_1, X_2, ...X_n$ be a random sample from $U(0,\theta)$. Then an unbiased estimator for θ is

(A) $\sum\frac{X_i}{n}$ (B) $\frac{n+1}{n}\ Max.(X_1,....,X_n)$
(C) $\frac{n+1}{n}\ Min.(X_1,....,X_n)$ (D) $Max.(X_1,....,X_n)$

63. The basic assumption for a simple linear regression model $y_i = \beta_0 + \beta_1 x_i + \in_i ;\ i = 1, 2, ..., n$ is (i) $E(\in_i) = 0$ (ii) $V\alpha r(\in_i) = \sigma^2$
Which of the following is correct?

(A) Only (i) is true
(B) Only (ii) is true
(C) Both (i) and (ii) are true
(D) Neither (i) nor (ii) are true

64. An unbiased estimate of variance of the sample proportion p under s.r.s is

(A) $\left(\frac{N-n}{N}\right)\frac{p(1-p)}{n}$
(B) $\left(\frac{N-n}{N}\right)\frac{p(1-p)}{n-1}$
(C) $\left(\frac{N-n}{N-1}\right)\frac{p(1-p)}{n}$
(D) $\left(\frac{N-n}{N-1}\right)\frac{p(1-p)}{n-1}$

65. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?

(A) 1/8
(B) 3/8
(C) 5/8
(D) 7/8

66. The solution of $|x^2 - 2x + 2| = 3x - 2$ is

(A) 1, 4
(B) $-1, 4$
(C) 4, 1
(D) $-4, -1$

67. The median of a set of 15 observations is 30.5. If each of the largest 6 observations of the set is increased by 5, then the median of the new set of observations is

(A) 2 times the original median
(B) increased by 5
(C) decreased by 5
(D) remains the same as that of the original set

68. The values of t for which $\begin{vmatrix} t-2 & 3 \\ 4 & t-1 \end{vmatrix} = 0$ are

(A) 4, 0
(B) 6, 2
(C) $-5, 2$
(D) $5, -2$

69. For the matrix $A = \begin{vmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \\ 8 & 9 & 1 \end{vmatrix}$ the minor of the element 5 is

(A) -30
(B) -31
(C) -33
(D) -10

70. The quadratic equation whose roots are $\pm i\sqrt{18}$ is

(A) $x^2 \pm i\sqrt{18} = 0$ (B) $x^2 + 2\sqrt{18} = 0$
(C) $x^2 - 18 = 0$ (D) $x^2 + 18 = 0$

71. 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 of the above

72. The probability of observing a more extreme value of the test statistic than the value observed, when the null hypothesis is true is

(A) Statistic (B) Parameter
(C) p-value (D) Level of significance

73. Process control is achieved through the technique of

(A) sample inspection plans (B) acceptance sampling plan
(C) control charts (D) sequential analysis

74. 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

75. The errors due to faulty planning of surveys are categorized as

(A) non-sampling error (B) non-response error
(C) sampling error (D) absolute error

76. An estimator T_n of $\psi(\theta)$ is said to be more efficient than any other estimator T_n^* of $\psi(\theta)$ if and only if

(A) $\mathrm{Var}(T_n) < \mathrm{Var}(T_n^*)$ (B) $\mathrm{Var}(T_n) / \mathrm{Var}(T_n^*) < 1$
(C) $\mathrm{Var}(T_n^*) / \mathrm{Var}(T_n) > 1$ (D) All of the above

77. If the variance of an estimator attains the Cramer-Rao lower bound, the estimator is

(A) most efficient (B) sufficient
(C) consistent (D) admissible

78. If X follows chi-square distribution with mean 2 and Y follows chi-square distribution with mean 1 and is distributed independently of X, then the distribution of $X/(X+Y)$ is

(A) $\beta_1(2,1)$ (B) $\beta_1(1,1/2)$
(C) $\beta_1(1/2,1)$ (D) $\beta_2(1,1/2)$

79. The measure of location which is the most likely to be influenced by extreme values in the data set is the

(A) range (B) median
(C) mode (D) mean

80. Two events, A and B, are mutually exclusive and each have a non zero probability. If event A is known to occur, the probability of the occurrence of event B is

(A) none (B) any positive value
(C) zero (D) any value between 0 to 1

81. A numerical description of the outcome of an experiment is called a

(A) descriptive statistic (B) probability function
(C) variance (D) random variable

82. The level of significance is the

(A) maximum allowable probability of type ii error
(B) maximum allowable probability of type i error
(C) same as the confidence coefficient
(D) same as the p-value

83. An important application of the chi-square distribution is

(A) making inferences about a single population variance
(B) testing for goodness of fit
(C) testing for the independence of two variables
(D) all of these alternative are correct

84. In inferential statistics, we study

(A) the methods to make decisions about population based on sample results
(B) how to make decisions about mean, median or mode
(C) how a sample is obtained from a population
(D) None of the above

85. In descriptive statistics, we study

(A) the description of decision making process
(B) the methods for organizing, displaying and describing data
(C) how to describe the probability distribution
(D) None of the above

86. When data are collected in a statistical study for only a portion or subset of all elements of interest we are using

(A) a sample
(B) a parameter
(C) a population
(D) both (B) and (C)

87. In Statistics, a sample is

(A) a portion of the sample
(B) a portion of the population
(C) all the items under investigation
(D) None of the above

88. Data in the Population Census Report is

(A) grouped data
(B) ungrouped data
(C) secondary data
(D) primary data

89. Which of the following is not based on all the observations?

(A) Arithmetic mean
(B) Geometric mean
(C) Mode
(D) Weighted mean

90. Statistic is a numerical quantity, which is calculated from

(A) population
(B) sample
(C) data
(D) observations

91. Which one of the following measurement does not divide a set of observations into equal parts?

(A) Quartiles
(B) Standard deviations
(C) Percentiles
(D) Deciles

92. Which branch of Statistics deals with techniques that are used to organize, summarise and present data?

(A) Advances statistics
(B) Probability statistics
(C) Inferential statistics
(D) Descriptive statistics

93. In Statistics, conducting a survey means

(A) collecting information from elements
(B) making mathematical calculations
(C) drawing graphs and pictures
(D) None of the above

94. The algebraic sum of deviations of the observations taken from mean is

(A) maximum
(B) zero
(C) minimum
(D) undefined

95. In Statistics, a population consists of

(A) all people living in a country
(B) all people living in the area under study
(C) all subjects or objects whose characteristics are being studied
(D) None of the above

96. Which one is the not measure of dispersion?

(A) The range
(B) 50^{th} percentile
(C) Inter-quartile range
(D) Variance

97. Sampling is simply a process of learning about the ……. on the basis of a sample drawn from it.

(A) census
(B) population
(C) group
(D) area

98. Numerical facts are usually subjected to statistical analysis with a view to helping a decision maker make wise decisions in the face of

(A) interpreting
(B) uncertainty
(C) summarizing
(D) organising

99. In Statistics, ……. classification includes data according to the time period in which of the items under consideration occurred.

(A) chronological
(B) alphabetical
(C) geographical
(D) topological

100. The …… process would be required to ensure that the data is complete and as required.

(A) tabulation
(B) analysis
(C) editing
(D) ordering

101. The method of sampling, in which the choice of sample items depends exclusively on the judgement of the investigator is termed as

(A) probability sampling
(B) quota sampling
(C) systematic sampling
(D) judgement sampling

102. The larger size of the population, the …….. should be the sample size.

(A) smaller
(B) larger
(C) accurate
(D) fixed

103. When the data is to be processed by computers, then it must be coded and converted into the

(A) English language
(B) regional language
(C) statistical language
(D) binary language

104. The basic objective of a sample is to draw ……. about the population from which such sample is drawn.

(A) conclusion
(B) characteristics
(C) inferences
(D) parameters

105. A …… variable is a variable whose values can theoretically take on an infinite number of values within a given range of values.

(A) continuous
(B) discrete
(C) random
(D) Both (A) and (B)

106. Before any procedures for …….., the purpose and the scope of the study must be clearly specified.

(A) data analysis
(B) data tabulation
(C) data collection
(D) data selection

107. A time series consists of

(A) short term variations
(B) long term variations
(C) irregular variations
(D) All of the above

108. The secular trend is measured by the method of semi averages when

(A) time series based on yearly values
(B) trend is linear
(C) time series consists of even number of values
(D) None of them

109. Increase in the number of patients in the hospital due to heat stroke is

(A) secular trend (B) irregular variation
(C) seasonal variation (D) cyclical variation

110. In time series seasonal variations can occur within a period of

(A) four years (B) three years
(C) one year (D) nine years

111. The method of moving average is used to find the

(A) secular trend (B) seasonal variation
(C) cyclical variation (D) irregular variation

112. Most frequently used mathematical model for analysis of a time series is

(A) autoregressive model (B) mixed model
(C) multiplicative model (D) regression model

113. In a straight line equation $Y = a + bX$, a is the

(A) X-intercept (B) slope
(C) Y-intercept (D) None of the above

114. In fitting a straight line, the value of slope b remain unchanged with the change of

(A) scale (B) origin
(C) both (A) and (B) (D) neither (A) and (B)

115. When the trend is of exponential type, the moving averages are to be computed by using

(A) arithmetic mean (B) geometric mean
(C) harmonic mean (D) weighted mean

116. The correlation coefficient is used to determine

(A) a specific value of the y-variable given a specific value of the x-variable
(B) a specific value of the x-variable given a specific value of the y-variable
(C) the strength of the relationship between the x and y variables
(D) None of the above

117. In regression analysis, the variable that is being predicted is the

(A) response, or dependent, variable
(B) independent variable
(C) intervening variable
(D) is usually x

118. Three unbiased coins are tossed, what is the probability of getting at least 2 tails?

(A) 1/3 (B) 1/6
(C) 1/2 (D) 1/8

119. In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that is neither blue nor green?

(A) 2/3 (B) 8/21
(C) 3/7 (D) 9/22

120. A box contains 20 electric bulbs, out of which 4 are defective. Two bulbs are chosen at random from this box. The probability that at least one of these is defective is

(A) 7/19 (B) 6/19
(C) 5/19 (D) 4/19

121. Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

(A) 1/2 (B) 2/5
(C) 8/15 (D) 9/20

122. Probability which is based on self beliefs of persons involved in experiment is classified as

(A) subjective approach (B) objective approach
(C) intuitive approach (D) sample approach

123. What is capability ratio?

(A) The ratio of process capability and number of units inspected
(B) The ratio of specification range and process capability
(C) The ratio of number of defectives and process capability
(D) The ratio of number of defectives and number of units inspected

124. Process control is carried out

(A) before production (B) during production
(C) after production control (D) All of the above

125. For a discrete random variable x, the probability mass function $f(x)$ represents

(A) the probability at a given value of x
(B) the area under the curve at x
(C) the area under the curve to the right of x
(D) None of the above

126. A perfect random number table would be one in which every digit has been entered

(A) chronologically (B) sequentially
(C) randomly (D) arbitrarily

127. Statistical inference deals with methods of inferring or drawing …….. about the characteristics of the population based upon the results of the sample taken from the same population.

(A) details (B) decisions
(C) conclusions (D) samples

128. When an investigator uses the data which has already been collected by others, such data is called

(A) primary data (B) collected data
(C) processed data (D) secondary data

129. A …….. sample is formed by selecting one unit at random and then selecting additional units at evenly spaced intervals until the sample has been formed.

(A) stratified (B) systematic
(C) judgement (D) random

130. The method of least squares dictates that one has to choose a regression line where the sum of the square of deviations of the points from the line is

(A) maximum (B) minimum
(C) zero (D) positive

131. The slope of regression line of Y on X is also called the

(A) correlation coefficient of X on Y
(B) correlation coefficient of Y on X
(C) regression coefficient of X on Y
(D) regression coefficient of Y on X

132. A box contains 5 green, 4 yellow and 3 white balls. Three balls are drawn at random. What is the probability that they are not of same colour?

(A) 52/55 (B) 3/55
(C) 41/44 (D) 3/44

133. The cumulative distribution function of a continuous random variable X is given by
$f(x)=0;\ x<1$
$=(x-1)^2/2;\ 1\le x<2$
$=(x-2)^3/2+1/2;\ 1\le x\le 3$
$=1;\ x>3$
Then $P(3/2<X<5/2)$ is equal to

(A) $3/16$ (B) $1/16$
(C) $5/16$ (D) $7/16$

134. If the probability density function of the Bivariate Normal distribution (BVN) is $f(x,y)=\frac{1}{18\sqrt{3\pi}}\exp\left[-\frac{8}{27}\left\{(x-7)^2+4(y+5)^2-2(x-7)(y+5)\right\}\right]$, then the parameters are

(A) $\mu_X=7,\ \mu_Y=-5,\ \sigma_X^2=36,\ \sigma_Y^2=9,\ \rho=0.5$
(B) $\mu_X=-7,\ \mu_Y=-5,\ \sigma_X^2=6,\ \sigma_Y^2=9,\ \rho=0.5$
(C) $\mu_X=7,\ \mu_Y=5,\ \sigma_X^2=36,\ \sigma_Y^2=3,\ \rho=0.5$
(D) $\mu_X=7,\ \mu_Y=5,\ \sigma_X^2=36,\ \sigma_Y^2=9,\ \rho=1$

135. If X and Y are independent exponential random variables each with parameter β, then $Z=X/X+Y$ has a

(A) U (0, 1) distribution (B) Gamma distribution
(C) Chi square distribution (D) F-distribution

136. Let $f(x)$ be an objective function of *n* variables in a LPP, then

(A) Minimum $\{f(x)\}=-\text{Maximum}\{f(x)\}$
(B) Minimum $\{-f(x)\}=\text{Maximum}\{-f(x)\}$
(C) Minimum $\{f(x)\}=\text{Maximum}\{-f(x)\}$
(D) Minimum $\{f(x)\}=-\text{Maximum}\{-f(x)\}$

137. In the context of sequencing problem, if there are *n* workers and *n* jobs, there would be

(A) *n* solutions (B) *n*! solutions
(C) $(n-1)!$ solutions (D) $(n!)^n$ solutions

138. If X is a normal random variable with mean μ and variance $\sigma^2 = 9$ and Z is a standardized normal random variable such that $P[X = 15] = P[Z = 1]$, then the value of mean μ is

(A) 7 (B) 12
(C) 7.5 (D) 16

139. If A and B are events such that $P(A) = p_1;\ P(B) = p_2;\ P(A \cap B) = p_3$ then $P(\bar{A} \cup B)$ is equal to

(A) $1 - p_1 + p_2$ (B) $1 - p_3$
(C) $1 - p_1 - p_2$ (D) $p_1 + p_2$

140. Probability of including a specified unit in a sample of size *n* selected out of *N* units is

(A) $1/n$ (B) $1/N$
(C) n/N (D) N/n

141. The value of $\lim_{x \to 0} \frac{e^{x/a} - e^{-x/b}}{\sin x}$ is

(A) $(a-b)/ab$ (B) $ab/(a-b)$
(C) $ab/(a+b)$ (D) $(a+b)/ab$

142. If in a (2×2) frequency table for two attributes A and B, the frequency of the cell *ab* is zero, the coefficient of colligation is equal to

(A) 0 (B) -1
(C) 1 (D) ∞

143. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$, then A^3 is

(A) A (B) $3A$
(C) $9A$ (D) 1

144. The rank of the matrix $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 8 & 12 \\ 3 & 6 & 9 \end{vmatrix}$ is

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

145. If $f(x)$ is an even function, then $\int_{-a}^{a} f(x)\,dx$ is

(A) 0 (B) $2\int_{0}^{a} f(x)\,dx$
(C) $\int_{0}^{2a} f(x)\,dx$ (D) $\int_{0}^{\frac{a}{2}} f(x)\,dx$

146. The value of $\int_{-1}^{2} |x|\,dx$ is

(A) 0 (B) 2
(C) 1 (D) None of the above

147. The variance of *n* observations is *V*. Each of these *n* observations is multiplied by *a* and subtracted by *b*. Then the variance of the new set of observations is

(A) V (B) V^2
(C) $aV - b$ (D) a^2V

148. The goodness of fit for data analysis is based on

(A) Normal distribution (B) F distribution
(C) Chi-square distribution (D) Exponential distribution

149. For a positively skewed distribution one of the following relationships holds.

(A) Mode < Median < Mean (B) Mean < Median < Mode
(C) Mode = Mea = Median (D) None of the above

150. If $X_1, X_2, ..., X_n$ is a random sample from Poisson distribution with parameter θ, then
Assertion I: $\bar{X}$ is sufficient for θ
Assertion II: $\bar{X}$ is an MLE for θ

(A) Both the Assertions I and II are true and Assertion I implies Assertion II.
(B) Both the Assertions I and II are true and Assertion I does not imply Assertion II.
(C) Both the Assertions I and II are false.
(D) Assertions I is true but Assertion II is false.

***