1. A random walk model is classified as

(A) ARIMA (1, 0, 1)

(B) ARIMA (0, 1, 0)

(C) ARIMA (0, 0, 0)

(D) ARIMA (1, 1, 1)

(E) Answer not known

2. When constant variance assumption fails in linear regression model then the model can be fitted using

(A) Generalised least squares

(B) Weighted least squares

(C) Ordinary least squares

(D) Maximum likelihood method

(E) Answer not known

3. Pass and fail or true and false is an example of

(A) Multinomial logistic regression

(B) Binary logistic regression

(C) Ordinal logistic regression

(D) None of the above

(E) Answer not known

4. In a logistic regression model, if we assume that the response variable $y_i$ is a Bernoulli random variable with probability function

$$\begin{array}{lccc} y_i & : & 1 & 0 \\ P(y_i) & : & \pi_i & (1-\pi_i) \end{array}$$

Then the linear Predictor $\eta$ is

(A) In $\frac{1-\pi}{\pi}$

(B) In $\frac{\pi}{1-\pi}$

(C) In $\frac{1+\pi}{\pi}$

(D) In $\frac{\pi}{1+\pi}$

(E) Answer not known

5. In generalized linear model, the response variable distribution must only be a member of

(A) Scale family

(B) Exponential family

(C) Logistic family

(D) Binary family

(E) Answer not known

6. In logistic regression, the expected frequencies of chi-squared statistic is

(A) $\sum_{i=1}^{n} \frac{(y_i - n_i\hat{\pi}_i)^2}{n_i\hat{\pi}_i(1-\hat{\pi}_i)}$

(B) $\sum_{i=1}^{n} \frac{n_i(y_i - n_i\hat{\pi}_i)^2}{\hat{\pi}_i(1-\hat{\pi}_i)}$

(C) $\sum_{i=1}^{n} \frac{(y_i - n_i\hat{\pi}_i)^2}{(1-\hat{\pi}_i)}$

(D) $\sum_{i=1}^{n} \frac{(y_i - n_i\hat{\pi}_i)^2}{\hat{\pi}_i(1-\hat{\pi}_i)}$

(E) Answer not known

7. If there is no linear relationship between the regressors then they are said to be

(A) Multicollinearity (B) Orthogonal

(C) Linearity (D) Residuals

(E) Answer not known

8. Multicollinearity can seriously affect ____________ with which regression coefficients are estimated.

(A) Accuracy (B) Average

(C) Precision (D) Percentage

(E) Answer not known

9. Assertion [A] : $\hat{\beta}_0$ is the residual sum of the squares.

Reason [R] : The minimum sum of squares corresponding to the least squares estimates $\hat{\beta}_0$ is usually called as sum of the squares about the regression line.

(A) [A] is false; [R] is true

(B) [A] is true; [R] is true

(C) [A] is true; [R] is false

(D) [A] is false; [R] is false

(E) Answer not known

10. If $R^2$ is zero, there is no multicollinearity, the variance inflation factor will be

(A) Three (B) Two

(C) One (D) Zero

(E) Answer not known

11. Sum of the squared deviation of actual and predicted value is minimised using

(A) Weighted least squares

(B) Ordinary least squares

(C) Generalised least squares

(D) Maximum likelihood estimate

(E) Answer not known

12. While testing in simple linear regression model accepting $H_0 : \beta_1 : 0$ indicates

(A) Regressor variable explains variability in response variable

(B) Regressor variable do not explains variability in response variable

(C) Regressor variable and response variables are independent

(D) Intercept has no effect

(E) Answer not known

13. When $\in_{ij} \sim N(0, \sigma^2)$ has what type of impact on the response variable of a simple linear regression model?

(A) $Y \sim N(0, \sigma^2)$

(B) $Y \sim N(0, 1)$

(C) $Y \sim N(\beta_0 + \beta_1 x, 1)$

(D) $Y \sim N(\beta_0 + \beta_1 x, \sigma^2)$

(E) Answer not known

14. If $\overline{x} = 39.5$, $\overline{y} = 47.5$, $\sigma_x = 10.8$, $\sigma_y = 16.8$ and the correlation coefficient of $x$ and $y$ is 0.42, then the regression equation of $y$ on $x$ is

(A) $y = 39.5 + 0.65x$ (B) $y = 10.8 + 0.65x$

(C) $y = 21.825 + 0.65x$ (D) $y = 47.5 + 0.65x$

(E) Answer not known

15. For testing the significance of regression co-efficient, the test statistic follows

(A) $t$ distribution with $(n-1)$ d.f

(B) $t$ distribution with $(n-2)$ d.f

(C) Chi-square distribution with $n$ d.f

(D) Chi-square distribution with $(n-1)$ d.f

(E) Answer not known

16. In fitting of best fit fine by the method of least squares, the error between observed and estimated points on the lines are

(A) Approaches to infinity (B) Minimise

(C) Maximise (D) Zero

(E) Answer not known

17. What is the null hypothesis for testing significance of regression?

(A) $H_0 : \mu = 0$ (B) $H_0 : \sigma = 0$

(C) $H_0 : r = 0$ (D) $H_0 : \beta_1 = 0$

(E) Answer not known

18. The least square estimator of simple linear regression model $\hat{\beta}_1$, is

(A) $\hat{\beta}_1 = \left[\sum_{i=1}^{n} y_i x_i - \frac{\sum_{i=1}^{n} y_i \sum_{i=1}^{n} x_i}{n}\right] / \left[\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}\right]$

(B) $\hat{\beta}_1 = \left[\sum_{i=1}^{n} y_i x_i + \frac{\sum_{i=1}^{n} y_i \sum_{i=1}^{n} x_i}{n}\right] / \left[\sum_{i=1}^{n} x_i^2 - \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}\right]$

(C) $\hat{\beta}_1 = \left[\sum_{i=1}^{n} y_i x_i - \frac{\sum_{i=1}^{n} y_i \sum_{i=1}^{n} xi}{n}\right] / \left[\sum_{i=1}^{n} x_i^2 + \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}\right]$

(D) $\hat{\beta}_1 = \left[\sum_{i=1}^{n} y_i x_i + \frac{\sum_{i=1}^{n} y_i \sum_{i=1}^{n} x_i}{n}\right] / \left[\sum_{i=1}^{n} x_i^2 + \frac{\left(\sum_{i=1}^{n} x_i\right)^2}{n}\right]$

(E) Answer not known

19. Which is not a property of least square estimator $\hat{\beta}$ is a multiple linear regression?

(A) $E(\hat{\beta}) = \beta$

(B) $(x^1 x)^{-1} x^1 x = I$

(C) $\operatorname{var}(\hat{\beta}) = \sigma^2 (x^1 x)^{-1}$

(D) $\operatorname{cov}(\hat{\beta}) \neq \operatorname{var}(\hat{\beta})$

(E) Answer not known

20. Multiple regression analysis based on

(i) Continuous response, categorical explanatory variables.

(ii) Continuous response, categorical and continuous explanatory variables.

(iii) Continuous response, categorical and ordinal explanatory variables.

(iv) Continuous response, continuous and ordinal explanatory variables.

(A) (i) and (ii)

(B) (i), (ii) and (iii)

(C) (i), (iii) and (iv)

(D) (i), (ii) and (iv)

(E) Answer not known

21. ARMA (1, 1) process is a stationary stochastic process where ____________ function breaks off.

(A) Autocorrelation

(B) Partial autocorrelation

(C) Both (A) and (B)

(D) Neither (A) nor (B)

(E) Answer not known

22. Which one of the following process is the stationary regardless of values of the weights?

(A) AR ($p$)

(B) ARMA ($p$, $q$)

(C) ARIMA ($p$, $d$, $q$)

(D) MA ($q$)

(E) Answer not known

23. The most satisfactory, flexible and widely used method for estimating the seasonal fluctuations in a time series is

(A) Simple average method

(B) Ratio to moving average method

(C) Ratio to trend method

(D) Semi-average method

(E) Answer not known

24. The concept of chain base index is most suitable when

(A) There are frequent changes in the items being considered

(B) The base year data is unavailable

(C) Price and quantity changes are minimal

(D) The base year remains constant for long period

(E) Answer not known

25. The index number of wholesale prices for the year 1977 was 185 as compared with the whole sales prices prevailing during the period 1970-71. The price increased in 1977 by ____________ over the period 1970-71 prices.

(A) 185% (B) 85%

(C) 15% (D) 200%

(E) Answer not known

26. Index numbers is a statistical measure that finds out the

(A) Exact change in values of variables

(B) Percentage change in the value of variables

(C) Positive change in the variable

(D) Total change in the value of the variable

(E) Answer not known

27. ____________ Model assumes that all the four components of the time series operate independently of each other.

(A) Multiplicative Model
(B) Additive Model
(C) Mixed Model
(D) Regression Model
(E) Answer not known

28. If the trend line is concave downwards, the value of the moving average will always be

(A) High
(B) Too high
(C) Low
(D) Too low
(E) Answer not known

29. Which of the following is example of the effect of population increase over a long period of time on the expansion of various sectors like agriculture industry, education, textiles, etc.

(A) Seasonal variation
(B) Cyclic variation
(C) Secular trend
(D) Irregular variation
(E) Answer not known

30. The equation $y = \alpha\beta^{cx}$ stands for

(A) Exponential curve
(B) Gompertz curve
(C) Both (A) and (B)
(D) Neither (A) nor (B)
(E) Answer not known

31. A group for moving average consists of

(A) 5-years period

(B) 3-years period

(C) A period which forms a cycle

(D) Long and short period

(E) Answer not known

32. In the variate difference method, the variance of first difference is used to analyse.

(A) The trend component

(B) The impact of cyclical variates

(C) The seasonal index

(D) The pressure random component

(E) Answer not known

33. The characteristic equation of an autoregressive model of order p determine

(A) The stationarity condition

(B) The moving average parameter

(C) The seasonal component

(D) The model adequacy

(E) Answer not known

34. If $w_j$ is the weight assigned to $j^{th}$ commodity, then the formulae of index numbers by using arithmetic mean obtained on taking the weighted average of the price relative become

(A) $\dfrac{\sum w_j (p_{ij} / p_{oj})}{\sum w_j} \times 100$

(B) $\dfrac{\sum w_j p_{ij}}{\sum w_j p_{oj}} \times 100$

(C) $\dfrac{\sum w_j p_{ij} / p_{oj}}{\sum w_j} \times 100$

(D) $\dfrac{\sum w_j p_{oj} / p_{ij}}{\sum w_j} \times 100$

(E) Answer not known

35. Dearness allowance of a certain cadre of people is fixed on the basis of ____________ Index Number.

(A) Price Index Number

(B) Consumer Price Index

(C) Quantity Index Number

(D) Cost of living Index Number

(E) Answer not known

36. The formula used to convert the chain base index number into fixed base index number is

(A) $\text{Current year FBI} = \dfrac{\text{Current year CBI} \times \text{Previous year FBI}}{100}$

(B) $\text{FBI} = \dfrac{\text{Current year CBI}}{\text{Previous year FBI}} \times 100$

(C) $\text{FBI} = \dfrac{\text{Previous year FBI}}{\text{Current year CBI}} \times 100$

(D) $\text{FBI} = \dfrac{\text{Current year FBI} \times \text{Previous year CBI}}{100}$

(E) Answer not known

37. The formula for calculating Laspeyre's quantity index number is

(A) $\frac{\sum q_0 p_0}{\sum q_1 p_1} \times 100$

(B) $\frac{\sum q_1 p_0}{\sum q_0 p_0} \times 100$

(C) $\frac{\sum q_0 p_1}{\sum q_1 p_1} \times 100$

(D) $\frac{\sum q_0 p_1}{\sum q_1 p_0} \times 100$

(E) Answer not known

38. The formula for Paasche's quantity index number is

(A) $\sum q_1 p_1 / \sum q_0 p_1 \times 100$

(B) $\sum q_1 p_0 / \sum q_0 p_0 \times 100$

(C) $\sum q_0 p_1 / \sum q_1 p_1 \times 100$

(D) $\frac{\sum q_0 p_0}{\sum q_1 p_0} \times 100$

(E) Answer not known

39. Match the index numbers with respective weights :

| | | | |
|---|---|---|---|
| (a) | Laspeyre's price index | 1. | Current year quantities |
| (b) | Paasche's price index | 2. | Arithmetic mean of the base year and current year quantities |
| (c) | Marshall-Edgeworth price index | 3. | Base year quantities |

| | (a) | (b) | (c) |
|---|---|---|---|
| (A) | 2 | 1 | 3 |
| (B) | 2 | 3 | 1 |
| (C) | 3 | 2 | 1 |
| (D) | 3 | 1 | 2 |

(E) Answer not known

40. Which of the following method is used to find the cost of living index?

(A) Laspeyre's method
(B) Paasche's method
(C) Fisher's method
(D) Bowley's method
(E) Answer not known

41. To compare a biased estimator with an unbiased estimator ____________ is used.

(A) Standard error of the estimate
(B) Mean square error of the estimate
(C) Sampling error
(D) Experimental error
(E) Answer not known

42. INSRSWOR, in variance of the sample mean, the finite population corrections

(A) $\frac{N-n}{N}$
(B) $\frac{n-1}{N}$
(C) $\frac{N-1}{N}$
(D) $\frac{N-n}{n}$
(E) Answer not known

43. Which of the following tests may be applied to ascertain whether the series of random numbers are really random?

(A) t test
(B) F test
(C) Gap test
(D) $\chi^2$ test
(E) Answer not known

44. Variance of the estimate of the population total Y in SRSWOR is

(A) $V(\hat{y}) = \frac{N^2 s^2}{n}(1-f)$

(B) $V(\bar{y}) = \frac{s^2}{n}(1-f)$

(C) $V(\hat{y}) = \frac{N s^2}{n}(1-f)$

(D) $V(\bar{y}) = \frac{s^2(1-f)}{Nn}$

(E) Answer not known

45. A simple random sample of size 5 is drawn without replacement from a finite population consisting of 41 units. If the population standard deviation is 6.25. What is the standard error of sample mean?

(A) 2.65

(B) 2.85

(C) 2.75

(D) 2.45

(E) Answer not known

46. Identify the first step in the principal steps in a sample survey

(A) Organisation of field work

(B) Selection of proper sampling design

(C) Defining the population to be sampled

(D) Objectives of the survey

(E) Answer not known

47. The multistage sampling procedure may be taken to be a better combinations of ____________ procedures.

(A) Random sampling and stratified sampling

(B) Random sampling and systematic sampling

(C) Random sampling and cluster sampling

(D) Random sampling and non random sampling

(E) Answer not known

48. The commonly used sampling procedure in large scale surveys is

(A) Multi-stage sampling

(B) Simple random sampling

(C) Cluster sample

(D) Systematic sampling

(E) Answer not known

49. The ratio estimator is more efficient than the sample mean under simple random sampling without replacement if

(A) $\rho < 1/2 \frac{c_x}{c_y}$

(B) $\rho = \frac{1}{2} \frac{c_x}{c_y}$

(C) $\rho > 1/2 \frac{c_x}{c_y}$

(D) $\rho \neq 1/2 \frac{c_x}{c_y}$

(E) Answer not known

50. Which of the following is/are true/false when cluster sampling is compared with simple random sampling

(i) Efficiency of cluster sampling increases as the mean square between cluster decreases.

(ii) Relative efficiency will increase with increase is the mean square with in cluster

(A) Both (i) and (ii) are true

(B) (i) is true (ii) is false

(C) (i) is false (ii) is true

(D) Both (i) and (ii) are false

(E) Answer not known

51. The variance of the estimate of the cluster sampling with $N$ total number of clusters and $n$ being the number of samples clusters is $V(\hat{y})$ = ————————, where $T_i$ is the observed total for the $i^{th}$ sampled cluster.

(A) $\frac{N-n}{n-1}\sum_{i=n}^{n}(T_i-\overline{T})^2$

(B) $\frac{n}{N}\sum_{i=n}^{n}(T_i-\overline{T})^2$

(C) $\frac{N}{n}\sum_{i=n}^{n}(T_i-\overline{T})^2$

(D) $\frac{N(N-n)}{n(n-1)}\sum_{i=n}^{n}(T_i-\overline{T})^2$

(E) Answer not known

52. A population has linear trend as $\{y_i = i, \ \ i = 1, 2 \ldots N\}$ and $N = nk$

| | | | |
|---|---|---|---|
| (a) | $Var(\overline{y})$ | 1. | $(nk+1)(k-1)/12$ |
| (b) | $Var(\overline{y}_n)_R$ | 2. | $(k^2-1)/(12n)$ |
| (c) | $Var(\hat{y}_{st})$ | 3. | $(k^2-1)/12$ |
| (d) | $Var(\overline{y}_{sys})$ | 4. | $[N(N+1)]/12$ |

Match the above correctly

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | 4 | 1 | 2 | 3 |
| (B) | 1 | 2 | 3 | 4 |
| (C) | 3 | 2 | 1 | 4 |
| (D) | 4 | 1 | 3 | 2 |

(E) Answer not known

53. If $\hat{y}_{st} = N\overline{y}_{st}$ is the estimator of the population total $y$, then $\hat{y}_{st}$ is an unbiased estimator and its sampling variance is

(A) $\sum N_i(N_i - n_i)S_i^2 / n_i$

(B) $\sum (N_i - n_i)S_i^2 / n_i$

(C) $\sum (N_i - n_i)S_i^2 / N_i$

(D) $\sum N_i(N_i - n_i)S_i^2 n_i$

(E) Answer not known

54. Mean of a systematic sample is more precise than the mean of a simple random sample if and only if

(A) $S^2{}_{wsy} < S^2$

(B) $S^2{}_{wsy} = S^2$

(C) $S^2{}_{wsy} > S^2$

(D) $S^2{}_{wsy} = 0$

(E) Answer not known

55. The relative efficiency of the estimate of the population mean in systematic sampling over SRSWOR if $\rho$ is maximum is

($\rho$ is the intra-class correlation coefficient between the units of the same systematic sample)

(A) $E = \dfrac{k-1}{nk-1}$

(B) $\dot{E} = \dfrac{k}{nk-1}$

(C) $E = \dfrac{k-1}{n-1}$

(D) $E = \dfrac{1}{nk-1}$

(E) Answer not known

56. For the given values find the value of $s^2$, mean square for the population using SRSWR

5, 10, 15

(A) 155

(B) 155.2

(C) 152.5

(D) 154

(E) Answer not known

57. $E = \dfrac{Var\,(\bar{y}_n)}{Var\,(\bar{y}_{sys})} = \dfrac{n(k-1)}{(nk-1)[1+(n-1)\rho]}$

Systematic sampling would be more efficient as compound with SRSWOR if the value of $\rho$

(A) $\rho < {}^{1}\!/_{nk-1}$

(B) $\rho > {}^{1}\!/_{nk-1}$

(C) $\rho < {}^{1}\!/_{nk-n}$

(D) $\rho > {}^{1}\!/_{nk=n}$

(E) Answer not known

58. If an unbiased estimator of the population total $\hat{y}_{ms} = \frac{N}{n} \sum_{i \in J} N_i \bar{y}_i$, $\bar{y}_i$. being the mean of the units sampled from the $i^{th}$ sampled primary stage units then $E(\hat{y}_{ms})$ is

(A) $y$

(B) $\bar{y}$

(C) $y^2/2$

(D) $2\bar{y}$

(E) Answer not known

59. The main function of Annual Survey of Industries (ASI) is

(i) To compute and publish the monthly index of industrial production.

(ii) To co-ordinate the conduct of annual survey of industries in all states and process the data for publication

(A) (i) only correct

(B) (ii) only correct

(C) (i) and (ii) are correct

(D) Both (i) and (ii) are not correct

(E) Answer not known

60. Warner's randomised response techniques involves the following distribution.

(A) Binomial distribution

(B) Poisson distribution

(C) Geometric distribution

(D) Exponential distribution

(E) Answer not known

61. A ―――――――― is a two-dimensional labelled data structure

(A) Data Frame (B) Series

(C) List (D) Tuple

(E) Answer not known

62. ―――――――― function returns a list of substrings separated by the specified delimiter.

(A) Split (delim.string) (B) Split (string.delim)

(C) Split (delim) (D) Spling (delim.str)

(E) Answer not known

63. The data can the rescaled with the help of ―――――――― class of Python Library.

(A) Min Max Scales (B) Scikit learn

(C) Read-CSV (D) Data frames

(E) Answer not known

64. ―――――――― method and ―――――――― method are used to add a single and multiple elements in a set in Python Programming.

(A) add ( ), copy ( ) (B) all ( ), add ( )

(C) add ( ), update ( ) (D) add ( ), all ( )

(E) Answer not known

65. Which among the following is the most popular python library for producing plots and other 2D data visualizations originally created by John D. Hunter?

(A) Numpy
(B) Matplotlib
(C) Pandas
(D) Scipy
(E) Answer not known

66. Scipy is a collection of mathematical algorithms and convenience functions built on

(A) Pandas
(B) Matplotlib
(C) Numpy
(D) Statistics
(E) Answer not known

67. In agglomerative clustering algorithm initially considered all the $n$ objects will have

(A) One clusters
(B) Two clusters
(C) $n$ clusters
(D) $(n-1)$ clusters
(E) Answer not known

68. The Naive Baye's classifier assumes that

(A) All features have the same variance
(B) Data is linearly separable
(C) Features are dependent
(D) Features are conditionally independent
(E) Answer not known

69. K-nearest neighbours algorithm used for

(A) Regression modeling

(B) Classification task

(C) Both (A) and (B)

(D) Estimation

(E) Answer not known

70. Unsupervised learning is helpful for

(A) Finding insights about problem

(B) Finding useful insights from the data

(C) Prediction

(D) Forecasting

(E) Answer not known

71. ———————— is used to visualize hierarchical clustering and can handle multidimensional data set.

(A) Scatter diagram

(B) Histogram

(C) Dendrogram

(D) Box plot

(E) Answer not known

72. Hierarchical clustering can be performed using

(A) Only the Agglomerative approach

(B) Only the divisive approach

(C) Either agglomerative (or) divisive approaches

(D) K-means clustering

(E) Answer not known

73. ______________ code is used for box and whisker plot in $R$.

(A) Scatter.plan ( )
(B) Scatter ( )
(C) Boxplot ( )
(D) Corplot ( )
(E) Answer not known

74. In $R$ programming, it is possible to divide the figure into several subfigures using the ______________ and ______________ parameter's of par [ ] function.

(A) mrow, mcol
(B) marrow, marcol
(C) mfrow, mfcol
(D) row, col
(E) Answer not known

75. In $R$, which of the following is not a data structure

(A) Vector
(B) Matrix
(C) Data Frame
(D) Hashmap
(E) Answer not known

76. In $R$ programming language detach ( ) is used to

(A) Access as built-in data frame
(B) Remove database from $R$ search
(C) Retrieve database from data frame
(D) Read the database
(E) Answer not known

77. In $R$ programming, the function class ( ) belongs to which library?

(A) stats

(B) base

(C) ut.ls

(D) class

(E) Answer not known

78. To unload a package when we work with what function need to be used

(A) Library

(B) Attach

(C) Detach

(D) Install.packages

(E) Answer not known

79. Choose the correct $R-$ programming expressions among the following.

(i) $P_1 <- dbinom(0, 5, .25)$

(ii) $P_1 < dbinom(0, 5, .25)$

(iii) $P_1 = dbinom(0, 5, .25)$

(iv) $P_1 = dbinom(0, 5, .25):$

(A) (i) only

(B) (i) and (ii) only

(C) (i) and (iii) only

(D) (ii) and (iii) only

(E) Answer not known

80. Which symbol is used in $R$ for commenting out a line of code?

(A) #

(B) //

(C) %

(D) $

(E) Answer not known

81. A box contains '$a$' white and '$b$' black balls '$c$' balls are drawn at random. Find the expected value of the number of white balls drawn.

(A) $\dfrac{ab}{a+b}$

(B) $\dfrac{bc}{a+b}$

(C) $\dfrac{a}{a+b}$

(D) $\dfrac{ca}{a+b}$

(E) Answer not known

82. If a coin is tossed, $S=\{w_1, w_2\}$, where $w_1 = H, w_2 = T; X(w)$ is defined as

$X(w)=\begin{cases}1, if\ w=H\\0, if\ w=T\end{cases}$, then $x(w)$ is a

(A) Bernoulli random variable

(B) Binomial random variable

(C) Independent random variable

(D) Both (A) and (B)

(E) Answer not known

83. Let $f(x)$ be the p.d.f of a random variable $x$, where $x$ is defined from $a$ to $b$, then geometric mean $G$ is given by

(A) $\log G = \int_a^b f(x)\, dx$

(B) $\log G = \int_a^b \log \frac{1}{x} f(x)\, dx$

(C) $\log G = \int_a^b \log x \cdot f(x)\, dx$

(D) $\log G = \int_a^b x f(x)\, dx$

(E) Answer not known

84. Let $X$ be distributed with pdf $f(x)=1, 0<x<1$ and zero elsewhere $E(x)=\frac{1}{2}$ and $E(x^2)=\frac{1}{3}$.

What is the variance of $2x+3$

(A) 1/12 (B) 1/6

(C) 1/3 (D) 10/3

(E) Answer not known

85. In a lottery $m$ ticket and drawn at a time out of $n$ ticket, numbered 1 to $n$. Then the expectation of the sum $S$ of the numbers on the tickets drawn

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

(C) $(n+1)/2$ (D) $(m+1)/2$

(E) Answer not known

86. The probability distribution of a random variable $x$ is $f(x) = k \sin \frac{1}{5} \pi x,\ 0 \leq x \leq 5$. What is constant $k$?

(A) $\pi/9$ (B) $\pi/4$

(C) $\pi/5$ (D) $\pi/10$

(E) Answer not known

87. $x$ and $y$ have joint p.d.f $f(x,y)=2, 0<x<y=1$. The conditional mean of $x$ given $Y=y$

(A) $E[X/Y=y]=\frac{y}{2}$

(B) $E[X/Y=y]=y$

(C) $E[X/Y=y]=2y$

(D) $E[X/Y=y]=\frac{1}{y}$

(E) Answer not known

88. The sample space of a statistical experiment $(\Omega, S)$, where $S$ is called

(A) Parameter space

(B) Sample space

(C) $\sigma-$ field

(D) Random field

(E) Answer not known

89. A die is rolled twice, let $A$ be the event that the first throw shows a number $\leq 2$ and $B$ be the event that the second throw shows atleast 5. Identify $P(A \cup B)$.

(A) 2/9

(B) 5/9

(C) 7/9

(D) 8/9

(E) Answer not known

90. For any event $A$ in $S$, $A$ and $S$ are

(A) Equally likely events

(B) Mutually exclusive events

(C) Independent events

(D) Dependent events

(E) Answer not known

91. A coin is tossed $(m+n)$ times, $(m>n)$. The probability of atleast $m$ consecutive heads is

(A) $\dfrac{2^{m+1}}{n+2}$ (B) $\dfrac{2^{m-1}}{n+2}$

(C) $\dfrac{n+2}{2^{m+1}}$ (D) $\dfrac{n-2}{2^{m+1}}$

(E) Answer not known

92. If in each trial of an experiment under identical conditions, the outcome is not ————, but may be any one of the possible outcome, the such an experiment is called a random experiment.

(A) Unique (B) Certain

(C) Uncertain (D) Both (B) and (C)

(E) Answer not known

93. If $Z = \dfrac{x-\mu}{\sigma}$, the moment generating function of $Z$ is given by

(A) $e^{\mu t/\sigma} M_x(t)$ (B) $e^{\mu t/\sigma} M_x(t/\sigma)$

(C) $e^{-\mu t/\sigma} M_x(t/\sigma)$ (D) $e^{-\mu t/\sigma} M_x(t/\sigma^2)$

(E) Answer not known

94. An investment consultant predicts that the odds against the price of a certain stock will go up during the next week are 2 : 1 and the odds in favour of the price remaining the same are 1 : 3 then the probability that the price of the stock will go down during the next week will be

(A) 1/3
(B) 1/4
(C) 7/12
(D) 5/12
(E) Answer not known

95. If the variable $x_i, i=1,2,...n$ are identical, then $\rho^3 = \sum_{i=1}^{n} p_i^3 = np_1^3$ and $\sigma^2 = \sum_{i=1}^{n} \sigma_i^2 = n\sigma_1^3$ then the value of $\frac{\rho}{\sigma}$ will be ———— which $\to 0$, as $n \to \infty$.

(A) $\frac{\sigma_1}{\rho_1} \times n^{1/6}$
(B) $\frac{\rho_1}{\sigma_1} \times \frac{1}{n^{1/6}}$
(C) $\frac{\rho_1}{\sigma_1} \times n^{1/6}$
(D) $\frac{\sigma_1}{\rho_1} \times \frac{1}{n^{1/6}}$
(E) Answer not known

96. Which of the following correct

(i) Markov theorem provides only a necessary condition for the weak law of large numbers to hold good.

(ii) For $\delta > 0$, $E|X_i|^{1+\delta}$, is unbounded then WLLN cannot hold for the sequence of r.v's $\{x_n\}$

(A) (i) only
(B) (ii) only
(C) (i) and (ii) wrong
(D) Both (i) and (ii)
(E) Answer not known

97. Let $\{x_n\}$ be a sequence of random variables such that $x_n \xrightarrow{L} X$ and let $c$ be a constant. Then

(i) $x_n + c \xrightarrow{L} X$

(ii) $cx_n \xrightarrow{L} cx, c \neq 0$

(A) (i) is correct and (ii) is not correct
(B) (i) is not correct and (ii) is correct
(C) Both (i) and (ii) are correct
(D) Both (i) and (ii) are not correct
(E) Answer not known

98. A necessary condition for the existence of weak law of large number is

(A) $E(x_i)$ exists for all $i$
(B) $E(x_i)$ not exists for all $i$
(C) $B_n = \text{var}(x_1 + x_2 + \ldots x_n)$ exists
(D) $\frac{B_n}{n^2} \to 0$ as $n \to \infty$
(E) Answer not known

99. Let $X_1, X_2 \ldots . X_n$ be independent random variables with common mean $o$ and variance $\sigma_k{}^2, k = 1,2 \ldots . n$ respectively then for any $\varepsilon > 0$.

(A) $P\left\{\underset{1 \le k \le n}{Max} |S_k| > \varepsilon\right\} \le \sum \frac{\sigma_i{}^2}{\varepsilon^2}$
(B) $P\left\{\underset{1 \le k \le n}{Max} |S_k| < \varepsilon\right\} \le \sum \frac{\sigma_i{}^2}{\varepsilon^2}$
(C) $P\left\{\underset{1 \le k \le n}{Max} |S_k| > \varepsilon\right\} \ge \sum \frac{\sigma_i{}^2}{\varepsilon^2}$
(D) $P\left\{\underset{1 \le k \le n}{Max} |S_k| < \varepsilon\right\} \le \sum \frac{\sigma_i{}^2}{\varepsilon^2}$
(E) Answer not known

100. Let $\{x_n\}$ be a strictly decreasing sequence of positive random variables and suppose that $X_n \xrightarrow{P} 0$. Then

(A) $X_n \xrightarrow{P} \infty$ (B) $X_n \xrightarrow{P} 1$

(C) $X_n \xrightarrow{a \cdot s} x$ (D) $X_n \xrightarrow{a \cdot s} 0$

(E) Answer not known

101. The region $W$ is called uniformly most powerful critical region of size $\alpha$ for testing $H_0 : \theta = \theta_0$ against $H_1 : \theta \neq \theta_1$ is, $H_1 : \theta = \theta_1 \neq \theta_0$ if

(A) $P(x \in w | H_1) \geq P(x \in w_1 | H_1)$ for all $\theta \neq \theta_0$

(B) $P(x \in w | H_1) \geq P(x \in w_1 | H_1)$ for all $\theta = \theta_0$

(C) $P(x \in w | H_1) \leq P(x \in w_1 | H_1)$ for all $\theta \neq \theta_0$

(D) $P(x \in w | H_1) \leq P(x \in w_1 | H_1)$ for all $\theta = \theta_0$

(E) Answer not known

102. If $\{f_\theta, \theta \in H\}$, families of pdf's has a monotone likelihood ratio (MLR) in statistic $T(x)$ if for $\theta_1 < \theta_2$, the ratio $\dfrac{f_{\theta_2}(x)}{f_{\theta_1}(x)}$ is a

(A) Non increasing function of $T(x)$

(B) Increasing function of $T(x)$

(C) Non decreasing function of $T(x)$

(D) Decreasing function of $T(x)$

(E) Answer not known

103. A test is said to be ―――――――― if the power of the test is not less than its size

(A) Complete (B) Efficient

(C) Sufficient (D) Unbiased

(E) Answer not known

104. If H is composite hypothesis then the probability of type I error of any test is a ―――――――― quantity.

(A) Constant (B) Variable

(C) Zero (D) Equal

(E) Answer not known

105. In likelihood Ratio test which of the following are True/False under certain assumptions

(i) $-2\log_e \lambda$ has an asymptotic chi-square distribution

(ii) LR test is consistent

(A) Both (i) and (ii) are false

(B) (i) is True (ii) is false

(C) Both (i) and (ii) are true

(D) (i) is false and (ii) is True

(E) Answer not known

106. Let $(X_1, X_2, \cdots X_n) \sim P(\lambda), \lambda > 0$. The Hypothesis $H : \lambda \leq \lambda_0$ Against $K : \lambda > \lambda_0$. Verify the following statements and identify which one is not relevant to this testing.

(i) $P(\lambda)$ is having MLR property

(ii) Most powerful test exist

(iii) Critical Region of the test is $\sum_{i=1}^{n} x_i > e$

(iv) Uniformly most relevant test exist

(A) Given statements are correct
(B) Only (i), (ii), (iii) are correct
(C) Only (i), (iii), and (iv) are correct
(D) Only (i), (ii), and (iv) are correct
(E) Answer not known

107. Which of the following statements are false w.r.t LRT?

(i) Under certain conditions, $-2\log_e \lambda$ has an asymptotic chi-square distribution.

(ii) Under certain assumptions, LRT is consistent

(A) Both (i) and (ii)
(B) Neither (i) nor (ii)
(C) Only (ii)
(D) Only (i)
(E) Answer not known

108. For resting $H_0 : \mu = \mu_0$ match the following for rejecting $H_0$

(a) $H_1 : \mu \neq \mu_0$   1. $\frac{\sqrt{n}(\overline{x} - \mu_0)}{S} > t_{n-1}(\alpha)$

(b) $H_1 : \mu > \mu_0$   2. $\frac{\sqrt{n}(\overline{x}) - \mu_0}{S} < -t_{n-1}(\alpha)$

(c) $H_1 : \mu < \mu_0$   3. $\left|\frac{\sqrt{n}(\overline{x} - \mu_0)}{S}\right| > t_{n-1}(\alpha/2)$

| | (a) | (b) | (c) |
|---|---|---|---|
| (A) | 3 | 2 | 1 |
| (B) | 1 | 3 | 2 |
| (C) | 3 | 1 | 2 |
| (D) | 1 | 2 | 3 |

(E) Answer not known

109. Match the following

(a) Size of the test   1. $\int_{w} L_1 dx$

(b) Power of the test   2. $\int_{\overline{w}} L_1 \, dx$

(c) P [Type II Error]   3. $\int_{w} L_0 \, dx$

| | (a) | (b) | (c) |
|---|---|---|---|
| (A) | 1 | 2 | 3 |
| (B) | 3 | 2 | 1 |
| (C) | 2 | 3 | 1 |
| (D) | 3 | 1 | 2 |

(E) Answer not known

110. Which of the following is incorrectly paired?

| | Statistics | Standard Error |
|---|---|---|
| (1) | $\bar{x}$ | $\sigma / \sqrt{n}$ |
| (2) | $s$ | $\sqrt{\frac{\sigma^2}{2n}}$ |
| (3) | $\mu_3$ | $\sigma^2 \sqrt{96 / n}$ |
| (4) | $r$ | $(1-\rho)^2 / \sqrt{n}$ |

(A) (1) and (2)
(B) (1) and (4)
(C) (2) and (3)
(D) (3) and (4)
(E) Answer not known

111. The power of the sign test of $H_0 : M = 28$ against $H_1 : M > 28$ for $N = 16$ at 5% level with the assumption of the population mean 29.04 and standard deviation 1, then the parameter $\theta$ is evaluated as

(A) $\theta = 0.8106$
(B) $\theta = 0.7105$
(C) $\theta = 0.6756$
(D) $\theta = 0.8508$
(E) Answer not known

112. Let C denote the subset of a sample space then C is best critical region of size $\alpha$ for testing the $H_0 : \theta = \theta'$ against $H_1 : \theta = \theta''$ if

(A) The probability of rejecting $H_0$ when $H_0$ is true is equal $\alpha$ and power of test maximized
(B) The test statistic always leads to the rejecting of $H_0$
(C) The probability of rejecting $H_0$ when $H_0$ is true less than $\alpha$
(D) The size of critical region is larger than $\alpha$, power is minimised
(E) Answer not known

113. Which of the following are incorrectly paired

| | | | |
|---|---|---|---|
| (1) | Median test | – | Equality of more than two populations |
| (2) | Run test | – | Test for Randomness |
| (3) | Kolmogorov-Smirnov test | – | Independence of attributes |
| (4) | Kruskal-Wallis test | – | The variable under study is discrete |

(A) (1), (2) (B) (2), (3)

(C) (3), (4) (D) (4), (1)

(E) Answer not known

114. In Mann - Whitney $U$ test, $U$ is defined as the number of times a $Y$ value precedes an $X$ value in the ordered arrangement of the combined sample of size $m+n$. The range of $U$ is

(A) $0 \leq U \leq m$ (B) $0 \leq U \leq n$

(C) $0 \leq U \leq mn$ (D) $0 \leq U \leq 1$

(E) Answer not known

115. Sequential probability ratio test terminates with probability

(A) 0 (B) 1

(C) 0.5 (D) 0.001

(E) Answer not known

116. One of the assumptions made in Non-parametric test is, that the variable under study is

(A) Qualitative

(B) Dependent

(C) Discrete

(D) Continuous

(E) Answer not known

117. For testing $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1$, the average sample number function for the sequential probability ratio test is ————————, where $z = \log\left(\frac{f(x,\theta_1)}{f(x,\theta_0)}\right)$, $A = \frac{1-\beta}{\alpha}$, $B = \frac{\beta}{1-\alpha}$.

(A) $E(n) = L(\theta)\log B - [1 - L(\theta)]\log A$

(B) $E(n) = L(\theta)\log B + [1 - L(\theta)]\log A$

(C) $E(n) = [L(\theta)\log B - [1 - L(\theta)]\log A] / E(z)$

(D) $E(n) = [L(\theta)]\log B + [1 - L(\theta)]\log A] / E(z)$

(E) Answer not known

118. Sign test considers the difference of observed values from hypothetical median value interms of

(A) Sign only

(B) Magnitude only

(C) Sign and Magnitude

(D) Ranks of difference

(E) Answer not known

119. To test $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1$ for a distribution with pdf $f(x, \theta)$. If

$L_{1m} = \prod_{i=1}^{m} f(x_i, \theta_1)$ when $H_1$ is true

$L_{0m} = \prod_{i=1}^{m} f(x_i, \theta_0)$ when $H_0$ is true then the likelihood ratio is $\lambda_m = \frac{L_{1m}}{L_{om}}$. The SPRT for testing $H_0$ against $H_1$ if

(i) If $\lambda_m \geq A$, we terminate the process with rejection of $H_0$

(ii) If $\lambda_m \geq B$, we terminate the process with acceptance of $H_0$

(iii) If $B < \lambda_m < A$, we continue sampling by taking an additional observation, where $A = \frac{1-\beta}{\alpha}, B = \frac{\beta}{1-\alpha}$.

(A) (i) and (iii) are correct

(B) (i) and (ii) are correct

(C) (ii) and (iii) are correct

(D) (i), (ii) and (iii) are correct

(E) Answer not known

120. Which of the following test use rank sums?

(A) Kruskal - Wallis and Wilcoxcon test

(B) Run-test

(C) Chi square test

(D) F test

(E) Answer not known

121. When two treatments at various levels involved is an experiment require large size plots, the appropriate experimental design is

(A) Split plot design
(B) Strip plot design
(C) Latin square design
(D) Randomised block design
(E) Answer not known

122. For the Balanced Incomplete Block design with parameters $v, b, k$ and '$r$' the error Degrees of Freedom is

(A) $(v-1)r+b-1$
(B) $(vr-b-v+1)$
(C) $(v-1)(r-1)$
(D) $rv-1$
(E) Answer not known

123. Find $SS_{Blocks}$ for the following BIBD

| | Block | | | |
|---|---|---|---|---|
| Treatment | 1 | 2 | 3 | 4 |
| 1 | 73 | 74 | – | 71 |
| 2 | – | 75 | 67 | 72 |
| 3 | 73 | 75 | 68 | – |
| 4 | 75 | – | 72 | 75 |

(A) 22.75
(B) 55
(C) 81
(D) 42.25
(E) Answer not known

124. For a homogeneous set of material, the Balanced Incomplete Block Design is ―――――――― than the Randomized Block Design.

(A) Less efficient

(B) More Efficient

(C) Equality efficient

(D) Efficient

(E) Answer not known

125. Efficiency of the split plot design is given by

(A) $E'' = \dfrac{(P-1)\,S\,E_1^2 + P(q-1)\,S\,E_2^2}{(Pq-1)\,S\,E_1^2}$

(B) $E'' = \dfrac{(P+1)\,S\,E_1^2 + P(q+1)\,S\,E_2^2}{(Pq+1)\,S\,E_1^2}$

(C) $E'' = \dfrac{(P-1)\;S\,E_1^2 - P(q-1)\,S\,E_2^2}{(Pq+1)\;SE_1^2}$

(D) $E'' = (P+1)\,SE_1^2 + P(q-1)\,SE_2^2\,/(pq-1)\,SE_1^2$

(E) Answer not known

126. Local control is used to reduce the

(A) Experimental Error

(B) Sampling Error

(C) Block size

(D) Experimental unit

(E) Answer not known

127. In fixed effect model $Y_{ij} = \mu + \alpha_i + E_{ij}$, $i = 1, \ldots k$, $j = 1 \ldots n$ the degrees of freedom for sum of squares error reduces to $(N-k)$ due to the linear constraint.

(A) $\sum_{i=1}^{k}\sum_{j=1}^{n_i}(Y_{ij} - \overline{Y}..) = 0$

(B) $\sum_{i=1}^{k} n_i(\overline{Y}_i. - \overline{Y}..) = 0$

(C) $\sum_{i=1}^{n_i}(Y_{ij} - \overline{Y}_i.) = 0$

(D) $\sum_{i=1}^{k}\sum_{j=1}^{n_i}(Y_{ij} - \overline{Y}.j) = 0$

(E) Answer not known

128. What are the variance components of random effects model?

(A) $\sigma_t^{\,2}$ and $\sigma^2$

(B) $\mu$ and $\sigma^2$

(C) $\mu$ and $\sigma$

(D) $\mu$ and $e_{ij}$

(E) Answer not known

129. Least square estimators of the parameters of a linear model are not

(A) Consistent

(B) Biased

(C) Asymptotically normal

(D) Efficient

(E) Answer not known

130. Gauss - Markov condition for BLUE is error have

(A) Zero means and equal variances

(B) Zero means, unequal variances

(C) Equal means and zero variance

(D) Equal means and equal variances

(E) Answer not known

131. Identify the wrong statement from the following fixed effect model

$Y_{ij} = \mu + \alpha_i + E_{ij}$

(A) All the observations are independent

(B) Different effects are additive

(C) $\alpha_i$'s are not fixed constants

(D) $E_{ij}$ are *iid* $N\left(0,\ \sigma_e^2\right)$

(E) Answer not known

132. In Latin square design

(i) Number of rows, columns and treatments are always equal

(ii) In each row and each column, a treatment occurs only once

(iii) Three ways classification design

(iv) Two ways variation is isolated in this design

(A) Statement (i), (ii), (iii) are true

(B) Statement (i), (ii), (iv) are true

(C) Statement (i), (iii) (iv) are true

(D) Statement (i), (ii), (iii) (iv) are true

(E) Answer not known

133. The smallest division of the experimental material to apply treatments to make observations on the variable under study is termed as

(A) Blocks

(B) Experimental unit

(C) Yield

(D) Experiment

(E) Answer not known

134. Split plot Design is also called a

(A) Experimental design

(B) Randomised design

(C) Nested design

(D) Plot design

(E) Answer not known

135. There is always error mean square in ―――――― with same data as compared to ―――――― and ――――――.

(A) CRD, LSD, RBD

(B) LSD, CRD, RBD

(C) RBD, LSD, CRD

(D) All the three or equal

(E) Answer not known

136. Given two factors A and B each at 2 levels, the simple effect B at the second level A is

(A) (ab) – (a)

(B) (ab) – (b)

(C) (a) – (ab)

(D) (b) – (ab)

(E) Answer not known

137. Total number of possible Latin squares of order $m \times m$ is

(A) $m \times (m-1) \times$ [Number of standard squares]

(B) $m! \times (m-1)! \times$ [Number of standard squares]

(C) $m! \times$ [Number of standard squares]

(D) $m \times$ [Number of standard squares]

(E) Answer not known

138. The standard error between any two treatment means without any missing observation is given by

(A) $\sqrt{\frac{m}{2\sigma_e^2}} = \frac{m}{2MSE}$

(B) $2\sigma_e^2 = 2MSS$

(C) $2\sigma_e^2 = 2MSE$

(D) $\sqrt{\frac{2\sigma_e^2}{m}} = \sqrt{\frac{2MSE}{m}}$

(E) Answer not known

139. Assertion [A] : Randomized Block design is not suitable for large number of treatments

Reason [R] : The block size will increase and it may not be possible to keep large block homogeneous

(A) [A] is true but [R] is false

(B) Both [A] and [R] are true and [R] is the correct explanation of [A]

(C) [A] is false [R] is true

(D) Both [A] and [R] are true, but [R] is not the correct explanation of [A]

(E) Answer not known

140. The formula for estimating one missing value in a randomized block design having r-blocks and t-treatments is

(A) $\frac{ry.j' + t\,y_i'. - y'.}{(r^2 - 1)}$

(B) $\frac{ry.j' + t\,y_i'.y'..}{(r-1)(t-1)}$

(C) $\frac{ry'.j + t\,y'i. - y'..}{(t+1)^2}$

(D) $\frac{ry'.j + t\,y'i. - y'..}{(r+1)(t+1)}$

(E) Answer not known

141. The moment generating function of binomial distribution with $n = 7$ and $p = 0.6$ :

(A) $(0.4 + 0.6e^t)^7$

(B) $(0.6 + 0.4e^t)^7$

(C) $(0.6e^t)^7$

(D) $(0.4e^t)^7$

(E) Answer not known

142. If $X$ has a binomial distribution with $n = 5$ and $p = \frac{1}{3}$, then mean of the binomial distribution is

(A) $\frac{5}{3}$

(B) $\frac{10}{9}$

(C) $\frac{3}{5}$

(D) $\frac{2}{5}$

(E) Answer not known

143. A light bulb manufacturing factory finds 10 in every 30 light bulbs defective. What is the probability that the first defective light bulb found when the $3^{rd}$ one is tested?

(A) 8/27

(B) 6/27

(C) 2/27

(D) 4/27

(E) Answer not known

144. Which of the following distribution has mean greater than its variance?

(A) Binomial distribution

(B) Geometric distribution

(C) Poisson distribution

(D) Exponential distribution

(E) Answer not known

145. If the moment generating function of a distribution is $\left(\frac{1}{3}\right)^5\left(1-\frac{2}{3}e^t\right)^{-5}, \frac{2}{3}e^t < 1$, then the distribution is

(A) $NB\left(r=5,\ p=\frac{1}{3}\right)$

(B) $NB\left(r=\frac{1}{3},\ p=5\right)$

(C) $NB\left(r=5,\ p=\frac{2}{3}\right)$

(D) $NB\left(r=-5,\ p=\frac{1}{3}\right)$

(E) Answer not known

146. ———————— distribution is obtained when population is finite and sampling is done without replacement.

(A) Binomial

(B) Poisson

(C) Negative binomial

(D) Hypergeometric

(E) Answer not known

147. Suppose $X$ denotes the life time of an equipment which may fall immediately on installation with probability $1-p$ or live upto the age $x$ with probability $p\left(1-e^{-\mu x}\right)$ what is the distribution function of $X$?

(A) $F(x) = e^{-\mu x}$

(B) $F(x) = 1 - e^{-\mu x}$

(C) $F(x) = 1 - e^{\mu x}$

(D) $F(x) = e^{\mu x}$

(E) Answer not known

148. In which of the following distribution the moment generating distribution doesn't exist

(i) Cauchy distribution

(ii) $t$-distribution

(iii) $F$-distribution

(A) (i) and (ii) only

(B) (i) and (iii) only

(C) (ii) and (iii) only

(D) (i), (ii) and (iiii)

(E) Answer not known

149. All the cumulants, except $K_1$ are unaltered by the

(A) Change of origin

(B) Change of scale

(C) Both change of origin and change of scale

(D) Neither change of origin nor change of scale

(E) Answer not known

150. If $X$ and $Y$ are two random variables such that $Y = aX + b$, $a, b \in R$ then $\phi_Y(t) =$

(A) $e^{itx}\phi_x(abt)$

(B) $e^{ita}\phi_x(bt)$

(C) $e^{itb}\phi_x(at)$

(D) $e^{itx}\phi_x(at)$

(E) Answer not known

151. If $|\phi_x(s)| = 1$ for some $s \neq 0$, then for some real $a$, $x - a$ is a lattice variable with mesh $h =$

(A) $\frac{\pi}{|s|}$

(B) $\frac{2\pi}{|s|}$

(C) $\frac{\pi}{s}$

(D) $\frac{2\pi}{s}$

(E) Answer not known

152. If $X$ is uniform random variable with mean = 1 and variance = 4/3 find $P(X < 0)$ is

(A) 0.25

(B) 1.25

(C) 0

(D) 1.65

(E) Answer not known

153. The standard deviation of the sampling distribution of a statistic is known as

(A) Level of significance

(B) Standard error

(C) Coefficient of variation

(D) Population mean

(E) Answer not known

154. If $f(x) = \frac{2}{\pi\left(4 + x^2\right)}$, $-\infty < x < \infty$ represents the p.d.f. a Cauchy distribution $(\lambda, \mu)$, then the value of $\lambda$ and $\mu$ are

(A) 2 and 4

(B) 4 and 2

(C) 2 and 0

(D) 0 and 2

(E) Answer not known

155. The mean of a standard Weibul distribution with shape parameter $c = 2$ is

(A) $\frac{3}{2}$

(B) $\left(\frac{1}{5}\right)!$

(C) $\left(\frac{1}{2}\right)!$

(D) $2!$

(E) Answer not known

156. Which of the following statements are correct about Normal Distribution (ND)?

(i) Normal Distribution is the limiting case of Binomial distribution as $n \to \infty$ and neither '$p$' nor '$q$' is very small.

(ii) $\beta_1 = 0$ and $\beta_2 = 3$

(iii) Mean, Median and Mode of the normal distribution does not coincide

(A) (i) only

(B) (i) and (ii) only

(C) (i) and (iii) only

(D) (ii) and (iii) only

(E) Answer not known

157. The points of inflexion of the chi-square distribution curve lie at the points

(A) $(n-2) \pm (n-2)^{1/2}$

(B) $(n-2) \pm \{2(n-2)\}^{1/2}$

(C) $(n-2) \pm 2(n-2)^{1/2}$

(D) $\left[\frac{n}{2(n-2)}\right]^{1/2}$

(E) Answer not known

158. The value of $\int_0^\infty y^{\alpha-1} e^{-y^{\alpha/\beta}} dy$ is

(A) $\frac{\alpha}{\beta}$

(B) $\frac{\beta}{\alpha}$

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

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

(E) Answer not known

159. $X$ follows exponential distribution with parameter $\lambda$. If $F(x)$ is the cumulative distribution function of $X$, then the distribution of $F(x)$ is

(A) Exponential distribution

(B) Uniform distribution

(C) Normal distribution

(D) Log Normal distribution

(E) Answer not known

160. As $n \to \infty$, the pdf of t-distribution with '$n$' degree of freedom tends to

(A) Standard normal distribution

(B) Normal distribution

(C) Chi-square distribution

(D) Log-Normal distribution

(E) Answer not known

161. Which of the following considerations is important in forming lots for inspection?

(A) Lots should be heterogeneous

(B) Lots should be homogeneous

(C) Smaller lots are preferred over larger ones

(D) Lots should be non conformable to the materials handling systems used

(E) Answer not known

162. If $\alpha$ and $\beta$ are the maximum producer's and consumer's risks, $\lambda_m$ is the likelihood ratio of sequencial probability ratio test then

(i) If $\lambda_m \geq \frac{1-\beta}{\alpha}$, we terminate the process with rejection of the lot.

(ii) If $\lambda_m \leq \frac{\beta}{(1-\alpha)}$, we terminate the process with acceptance of the lot.

(A) (i) is correct and (ii) is not correct

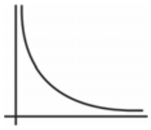
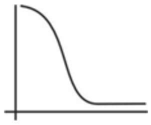
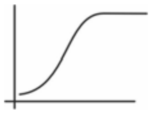
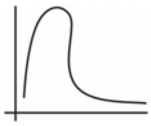
(B) (i) is not correct and (ii) is correct

(C) Both (i) and (ii) are correct

(D) Both (i) and (ii) are not correct

(E) Answer not known

163. Match the following based on its nature.

| | | | |
|---|---|---|---|
| (a) |  | 1. | OC Curve |
| (b) |  | 2. | ASN Curve |
| (c) |  | 3. | AOQ Curve |
| (d) |  | 4. | ATI Curve |

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | 4 | 1 | 2 | 3 |
| (B) | 3 | 4 | 1 | 2 |
| (C) | 1 | 2 | 3 | 4 |
| (D) | 2 | 1 | 4 | 3 |

(E) Answer not known

164. The maximum limit of percentage defectives in a finally accepted product is called

(A) Acceptance quality level

(B) Average Outgoing Quality limit

(C) Lot tolerance percentage defective

(D) Average sample number

(E) Answer not known

165. Consumers risk is the probability of

(A) Accepting a defective lot

(B) Rejecting a good lot

(C) Detecting all defects in a lot

(D) Increasing production cost

(E) Answer not known

166. If the probability of detecting an out of Control condition increases, the Average Run Length (ARL) will

(A) Increase

(B) Decrease

(C) Remain Constant

(D) Depend on the sample size

(E) Answer not known

167. Check and validate the statement

Statement 1 : Six SIGMA and DFSS (Design For Six SIGMA) are same

Statement 2 : Six SIGMA used to achieve operational excellence.

Statement 3 : DFSS focus on increasing value in the organisation.

(A) Statement 1, 2, 3 are true

(B) Statement 1 false, 2 and 3 are true

(C) Statement 1 and 2 true, 3 false

(D) Statement 1 true, 2 and 3 false

(E) Answer not known

168. The primary goal of Six-sigma is

(A) To reduce the process variation and defects

(B) Increase production speed

(C) Reduce the production cost

(D) To detect the small shift in the process

(E) Answer not known

169. Which of the following are the tools used in define phase of DMAIC methodology?

I. Project Charter

II. Process Map

III. Process Capability Analysis

(A) I and II only

(B) I and III only

(C) II and III only

(D) III only

(E) Answer not known

170. The cusum plot is not a control chart because it lacks in

(A) Lower control limit

(B) Central line

(C) Upper control limit

(D) All the above

(E) Answer not known

171. In SPRT, the criterion for acceptance of the lot with usual notations is

(A) $\lambda_m \leq \frac{\beta}{1-\alpha}$

(B) $\lambda_m \geq \frac{\beta}{1-\alpha}$

(C) $\lambda_m \leq \frac{1-\beta}{\alpha}$

(D) $\lambda_m \geq \frac{1-\beta}{\alpha}$

(E) Answer not known

172. The values of notations used in $\bar{x}$ and $\overline{R}$ control charts are

(i) $A_2 = \frac{3}{d_2\sqrt{n}}$

(ii) $D_3 = 1 - 3 \times \frac{d_3}{d_2}$

(iii) $D_4 = 1 - 3 \times \frac{d_2}{d_3}$

(A) (i) and (ii) are correct

(B) (ii) and (iii) are correct

(C) (i) and (iii) are correct

(D) All (i), (ii) and (iii) are correct

(E) Answer not known

173. The Average Sample Number of Double Sampling plan is given by

(A) ASN = $\frac{n_1 + n_2}{(1 - P_1)}$

(B) ASN = $n_1 - n_2(1 - P_1)$

(C) ASN = $n_1 + n_2(1 - P_1)$

(D) ASN = $\frac{n_1}{n_1 + n_2(1 - P_1)}$

(E) Answer not known

174. Choose correct one to calculate the 'capability ratio'.

(A) The ratio of specification range and process capability

(B) The ratio of process capability and number of units inspected

(C) The ratio of number of defectives and process capability

(D) The ratio of number of defectives and number of units inspected

(E) Answer not known

175. The Schewhart control charts are meant.

I. To detect whether the process is under statistical quality control.

II. To find the assignable causes.

III. To find the chance factor

IV. To reflect the selection of samples

(A) I, II and III only

(B) II, III and IV only

(C) III, IV and I only

(D) I, II and IV only

(E) Answer not known

176. If the lot fraction defective is $p = 0.01$, $n = 89$ and $c = 1$, then the probability that the 'd'-defectives less than or equal to '$c$' is

(A) $(0.99)^{89} + 89(0.01)(0.99)^{88}$

(B) $(0.01)^{89} + 89(0.99)(0.01)^{88}$

(C) $(0.99)^{89} + (0.01)\ (0.99)^{88}$

(D) $(0.01)^{89} + (0.99)(0.01)^{88}$

(E) Answer not known

177. When there is no defective in the lot, the OC function for $p = 0$ is

(A) $L(0) = 1$

(B) $L(0) = 1$

(C) $L(0) = \infty$

(D) $L(0) = -\infty$

(E) Answer not known

178. Match the following.

| | | | |
|---|---|---|---|
| (a) | p-chart | 1. | Control chart for averages |
| (b) | $\overline{X}$-chart | 2. | Control chart for fraction defectives |
| (c) | c-chart | 3. | Control chart for number of defectives |
| (d) | d-chart | 4. | Control chart for number of defects per unit |

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | 1 | 2 | 4 | 3 |
| (B) | 2 | 1 | 3 | 4 |
| (C) | 1 | 3 | 4 | 2 |
| (D) | 2 | 1 | 4 | 3 |

(E) Answer not known

179. Which of the following chart is used to monitor process dispersion?

(A) $\overline{X}$-chart
(B) p-chart
(C) np-chart
(D) R-chart
(E) Answer not known

180. If there is a correlation between $\overline{X}$ and R values, then this indicates that the underlying distribution is

(A) Normal
(B) Skewed
(C) Distribution not identified
(D) Different underlying dist
(E) Answer not known

181. $S^*$ is called the minimax estimator of $\theta$ if

(A) $\max_{\theta} R(\theta, \delta^*) \leq \max_{\theta} R(\theta, \delta)$

(B) $\min_{\theta} R(\theta, \delta^*) \leq \min_{\theta} R(\theta, \delta)$

(C) $\max_{\theta} R(\theta, \delta^*) \leq \min_{\theta} R(\theta, \delta)$

(D) $\min_{\theta} R(\theta, \delta^*) \leq \max_{\theta} R(\theta, \delta)$

(E) Answer not known

182. Identify the correct statements

(i) Bayes estimator of $\theta$ under a given loss function is not existing.

(ii) Bayes estimator of $\theta$ under an absolute error loss function is the median of the posterior distribution.

(iii) Bayes estimator of $\theta$ under squared error loss function is the mean of the posterior distribution.

(iv) Bayes estimator of $\theta$ is the mean of prior distribution

(A) (i) and (ii)

(B) (ii) and (iii)

(C) (i) and (iii)

(D) (i) and (iv)

(E) Answer not known

183. Let $x_1, x_2, \ldots\ldots x_n$ be a sample from $N(0, \sigma^2)$ which is correct?

(i) $\sum_{i=1}^{n} x_i^2$ is a minimal sufficient statistic for $\sigma^2$

(ii) $\sum_{i=1}^{n} x_i$ is not sufficient for $\sigma^2$

(A) Only (i) is correct

(B) Only (ii) is correct

(C) Both (i) and (ii) are correct

(D) Both (i) and (ii) are not correct

(E) Answer not known

184. Say True or False

(i) MLE's are always consistent estimator but need not be unbiased.

(ii) MLE's are unique.

(A) (i) is true and (ii) is also true

(B) (i) is true and (ii) is false

(C) (i) is false and (ii) is true

(D) (i) is false and (ii) is also false

(E) Answer not known

185. The formula for calculating chi-square $(\chi^2)$ value is

(A) $\chi^2 = \sum_{i=1}^{n} \frac{(o_i - e_i)^2}{e_i}$

(B) $\chi^2 = \sum_{i=1}^{n} \frac{(o_i + e_i)^2}{e_i}$

(C) $\chi^2 = \sum_{i=1}^{n} \frac{(o_i - e_i)}{e_i}$

(D) $\chi^2 = \sum_{i=1}^{n} \frac{(o_i + e_i)}{e_i}$

(E) Answer not known

186. The $100(1-\alpha)\%$ confidence interval for the parameter $\theta$ of normal distribution $N(\theta, \sigma^2)$ is

(A) $\left[\theta \pm t_\alpha \frac{s}{\sqrt{n}}\right]$

(B) $\left[\overline{x} \pm t_\alpha \frac{s}{\sqrt{n}}\right]$

(C) $\left[\mu \pm t_\alpha \frac{s}{\sqrt{n}}\right]$

(D) $\left[x \pm t_\alpha \frac{s}{\sqrt{n}}\right]$

(E) Answer not known

187. The maximum likelihood estimate of a parameter $\alpha$ of a population having density function $\frac{2}{\alpha^2}(\alpha - x)$ $0 < x < \alpha$ for a sample of unit size is $2x$. Find out the MLE of $\alpha$

(A) $\hat{\alpha} = 2a$

(B) $\hat{\alpha} = 2x$

(C) $\hat{\alpha} = 2\alpha$

(D) $\hat{\alpha} = 2\alpha x$

(E) Answer not known

188. Let $I(\theta)$ be the Frisher information on $\theta$, supplied by the sample. If T is an unbiased estimator of $4(\theta)$, then the variance of T will be

(A) Greater than or equal to $\frac{1}{I(\theta)}\left(\frac{S4}{S\theta}\right)^2$

(B) Less than or equal to $\frac{1}{I(\theta)}\left(\frac{S4}{S\theta}\right)$

(C) Greater than or equal to $\frac{1}{I(\theta)}$

(D) Less than or equal to $\frac{1}{I(\theta)}$

(E) Answer not known

189. Match the following :

| | | | |
|---|---|---|---|
| (a) | Cramer Rao Inequality | 1. | MVUE through sufficient statistics |
| (b) | Rao Blackwell Theorem | 2. | Sufficient statistics |
| (c) | Lehman Scheffee Theorem | 3. | MVB estimator |
| (d) | Neyman Factorisation Theorem | 4. | UMVUE through complete sufficient statistics |

| | (a) | (b) | (c) | (d) |
|---|---|---|---|---|
| (A) | 4 | 1 | 2 | 3 |
| (B) | 3 | 1 | 4 | 2 |
| (C) | 3 | 4 | 1 | 2 |
| (D) | 1 | 3 | 4 | 2 |

(E) Answer not known

190. In sampling from the population with pdf

$f(x,\theta) = \dfrac{1}{\pi\left[1+(x-\theta)^2\right]}$, $\begin{matrix} -\infty < x < \infty \\ -\infty < \theta < \infty \end{matrix}$ the Cramer-Rao lower bound for an unbiased estimator of $\theta$ is

(A) $\dfrac{n}{2}$ (B) $\dfrac{2}{n}$

(C) $\dfrac{2}{n^2}$ (D) $\dfrac{n^2}{2}$

(E) Answer not known

191. Let $T_n$ be an estimator of $\theta$. If $T_n \xrightarrow{P} \theta$, then

(A) $T_n$ is a sufficient estimator of $\theta$

(B) $T_n$ is an unbiased estimator of $\theta$

(C) $T_n$ is a consistent estimator of $\theta$

(D) $T_n$ is an efficient estimator of $\theta$

(E) Answer not known

192. If X follows Poisson distribution with parameter $\theta$, then which of the following is an unbiased estimator of $e^{-4\theta}$?

(A) $(-3)^X$ (B) $(-4)^X$

(C) $(4)^X$ (D) $(3)^X$

(E) Answer not known

193. Eliminate the odd one

(A) Sample mean $(\overline{X}n)$ is always a consistent estimator of the pop mean by WLLN

(B) $N(\mu, \sigma^2)$ the sample mean is a consistent estimator of $\mu$

(C) For Cauchy's distribution sample mean is a consistent estimator of pop mean

(D) For Cauchy's distribution sample median is a consistent estimator of $\mu$

(E) Answer not known

194. Let $x_1, x_2 \ldots x_n$ be a random sample from $N(\mu, \sigma^2)$ population. Then the sufficient estimator for $\mu$ is

(A) $\overline{x}$

(B) $\Sigma x_i$

(C) $\Sigma x_i^2$

(D) $\Sigma(x_i - \overline{x})^2$

(E) Answer not known

195. If $T$ is a sufficient estimator for the parameter $\theta$ and if $\psi(T)$ is a one to one function of $T$, then $\psi(T)$ is __________ for $\psi(\theta)$

(A) Unbiased

(B) Consistent

(C) Sufficient

(D) Uniformly minimum variance

(E) Answer not known

196. If $T$ is an unbiased estimator of parameter $\theta$ and $\gamma(\theta) = \theta$, then $v(t)$ is

(A) $v(t) \geq \frac{[\gamma(\theta)]^2}{I(\theta)}$

(B) $v(t) \geq \frac{1}{I(\theta)}$

(C) $v(t) = \frac{1}{I(\theta)}$

(D) $v(t) \leq \frac{1}{I(\theta)}$

(E) Answer not known

197. Let $x_1, x_2, ...$ be *iid* $b(1, p)$ random variables which one of the following is true?

(A) $\overline{X}$ is inconsistent estimator of $p$

(B) $\overline{X}$ is consistent estimator of $p$

(C) $\overline{X}$ is consistent estimator of $q$

(D) $\overline{X}$ is consistent estimator of $pq$

(E) Answer not known

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

(A) Most efficient

(B) Sufficient

(C) Consistent

(D) Unbiased

(E) Answer not known

199. If $x_1\, x_2 .... x_n$ is a random sample from a normal population $N(\mu, 1)$ then the value of $E(t)$, where $t = \frac{1}{n} \sum x_i^2$ is

(A) $1+t^2$

(B) $1+\mu^2$

(C) $t^2$

(D) $\sigma^2$

(E) Answer not known

200. If $x_1, x_2, .... x_n$ is a random sample from a population $f(x) = \theta x^{\theta-1}$; $0 < x < 1$, $\theta > 0$. Then sufficient estimator of $\theta$ is

(A) $\sum_{i=1}^{n} x_i$

(B) $\overline{x}$

(C) $\prod_{i=1}^{n} x_i$

(D) $\min(x_1, x_2, ..., x_n)$

(E) Answer not known

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