M/P ENT - 32

Total No. of Pages : 12

Seat No.	

M.Phil./Ph.D. Entrance Examination, September - 2022

STATISTICS

Sub. Code : 58794

Day and Date : Saturday, 24 - 09 - 2022 **Total Marks : 100**
Time : 10.00 a.m. to 12.00 noon

Instructions :

1) **All questions are compulsory.**
2) **Each question carries 2 marks.**
3) **Answers should be marked in the given OMR answer sheet by darkening the appropriate option.**
4) **Use black ball point pen only for marking the circle. Do not make any stray mark on the OMR Answer Sheet.**
5) **Follow the instructions given on OMR sheet.**
6) **Rough work shall be done on the sheet provided at the end of question paper.**
7) **Only non-programmable calculators are allowed.**

1. What are the steps in research design?

A) Proper selection of study
B) Objective of the study
C) Nature of the study
D) All the above

2. Which is not main objective of research?

A) To develop new scientific method
B) To discover new things and test the existing facts
C) To identify the cause and effect relationship
D) None of the above

3. Which is not a tool for searching a research topic?

A) Books
B) Journals
C) Research hypothesis
D) Internet

4. Which of the following is a part of the research design?

A) Sampling design
B) Observational design
C) Statistical design
D) All the above

5. Which of the following statement is wrong?

A) The research hypothesis is a predictive statement.
B) Usually a research hypothesis must contain, at least, one independent and one dependent variable.
C) When a prediction is to be tested by scientific methods, it is termed as research hypothesis.
D) The research hypothesis is a predictive statement that relates a response variable to a dependent variable.

6. Which is not probability sampling?

A) Systematic sampling
B) Simple random sampling
C) Quota sampling
D) Clustering sampling

7. The research undertaken specifically for the purpose of obtaining information to help resolve a particular problem, is called

A) Applied research
B) Basic research
C) Fundamental research
D) None of the above

8. Which one of the following sampling methods is based on probability?

A) Convenience sampling
B) Quota sampling
C) Judgment sampling
D) Stratified sampling

9. Which one of the following is an indication of quality of a research journal?

A) Impact factor
B) h-index
C) g-index
D) i10-index

10. Which of the following is an initial mandatory requirement for pursuing research?

A) developing a research design

B) formulating a research question

C) deciding about the data analysis procedure

D) formulating a research hypothesis

11. A working hypothesis is ...

A) a proven hypothesis for an argument

B) not required to be tested

C) a provisionally accepted hypothesis for further research

D) a scientific theory

12. The population information is called parameter while the corresponding sample information is known as

A) Universe

B) Inference

C) Sampling design

D) Statistics

13. When academicians are called to deliver lecture or presentations to an audience on certain topics or a set of topics of educational nature, it is called ...

A) Training program

B) Seminar

C) Workshop

D) Symposium

14. A class of 14 students is made up of 6 girls and 8 boys. From this class, a group of 5 students is chosen to represent the class at a competition. Determine the number of different groups of 5 that can be formed if there must be 2 girls and 3 boys in each group.

A) 71

B) 560

C) 840

D) 10080

15. A special combination lock that has 60 numbers on the dial works by turning it first to the right, then to the left, and then to the right, with 3 different selected numbers needed to open the lock. The selection of these 3 numbers is an example of

A) a permutation

B) a combination

C) both a combination and permutation

D) neither a combination nor a permutation

16. The two-segment trapezoidal rule of integration is exact for integrating at most _____ order polynomials.

A) first B) second

C) third D) fourth

17. Newton-Raphson Method is also called _____

A) Bolzano's bisection method B) Iterative method

C) Method of tangents D) Newton's method

18. Which of the following is a fastest method?

A) Gauss Elimination B) Gauss Jordan

C) Gauss Seidal D) Gauss Jacobi

19. For what value (s) of x does the graph of $f(x) = \frac{1}{3}x^3 - x^2 + 3$ have a horizontal tangent?

A) 0 B) 0 and 3

C) 2 D) 0 and 2

20. Exploratory data analysis (EDA) package from SAS institute is

A) JMP

B) KNIME

C) Python

D) Tinkcer plots

21. Tukey's trimean in terms of three quartiles of distribution is given by

A) $\frac{Q_1 + Q_2 + Q_3}{3}$

B) $Q_2 + \frac{Q_1 + Q_3}{2}$

C) $\frac{1}{2}\left(Q_2 + \frac{Q_1 + Q_3}{2}\right)$

D) $\frac{1}{3}\left(Q_2 + \frac{Q_1 + Q_3}{2}\right)$

22. The EDA technique of ordering objects characterized by values on multiple variables so that similar objects are near each other and dissimilar objects are farther from each other is called

A) Principle component analysis

B) Multidimensional scaling

C) Redundancy analysis

D) Gradient analysis

23. *Statement 1 : Bootstrap gives different results when repeated on same data*

Statement 2 : Jacknife gives same result each time when repeated on same data

A) Only Statement 1 is true

B) Only Statement 2 is true

C) Both Statements are true

D) Neither Statement 1 nor Statement 2 is true

24. *Statement 1 : Estimating the value of π is an example for static simulation model.*

Statement 2 : A system of differential equation is representing a chemical reaction is a stochastic simulation model

A) Only Statement 1 is true

B) Only Statement 2 is true

C) Both Statements are true

D) Neither Statement 1 nor Statement 2 is true

25. Gaussian elimination algorithm is used for

I. Solving system of non-linear equations

II. Solving system of linear equations

III. Finding rank, determinant and inverse of invertible matrix

A) I and II are true

B) II and III are true

C) I and III are true

D) All the three are true

26. Which one of the following is not an example of nonsampling error?

A) Measurement error

B) Refusal by a unit to respond

C) Editing error

D) Error due to selecting only part of the population as the sample

27. Desraj ordered estimators are

A) Independent

B) Less efficient

C) Pairwise uncorrelated

D) None of the above

28. The quadratic form $(X+Y)^2$ is

A) Positive definite
B) Positive semi definite
C) Negative semi definite
D) Negative definite

29. Consider the following system of equations X+Y=3, X–Y=1, 2X+Y=5, the system has

A) No solution
B) Unique solution
C) More than one solution
D) None of the above

30. Which of the following statements is true?

A) Limit point of a set always exists
B) Every closed set is a compact set
C) Φ and $\mathbb{R}$ are closed sets
D) Derived set of a set is open

31. In R, _____ initiates an infinite loop right from the start.

A) never
B) repeat
C) break
D) set

32. In R, vectors come in two parts: _____ and _____

A) atomic vectors and matrix
B) atomic vectors and array
C) atomic vectors and list
D) none of these

33. In the MP level α test, power of the test β satisfies ...

A) $\beta \geq \alpha$
B) $\beta < \alpha$
C) $\beta > \alpha$
D) $\alpha + \beta = 1$

34. A test function $\phi(x) = 0.05, \forall x$ has the power ...

A) 0 B) 1

C) 0.05 D) 0.95

35. The relation of accessibility of states is

A) Transitive and reflexive B) Transitive and symmetric

C) Only reflexive D) Only transitive

36. The Yule-Furry process is a particular case of

A) Birth-death process B) Branching process

C) Pure birth process D) Stationary process

37. Let $X_1, X_2, ..., X_n$ be a random sample from $N(\theta, \theta^2)$ distribution. Then, which of the following is true?

A) The statistics $T_1 = \sum_{i=1}^{n} X_i$ is minimal sufficient for θ

B) The distribution $N(\theta, \theta^2)$ belongs to a regular exponential family

C) The statistics $T_2 = \left(\sum_{i=1}^{n} X_i, \sum_{i=1}^{n} X_i^2 \right)$ is minimal sufficient for θ

D) T_2 is a complete statistic

38. Let X be three observations from a 2-dimensional random variable X, where

$$X = \begin{pmatrix} 0 & 6 \\ 2 & 4 \\ 1 & 2 \end{pmatrix}$$

Then, the sample covariance matrix is

A) $\begin{pmatrix} 1 & -1 \\ -1 & 4 \end{pmatrix}$ B) $\begin{pmatrix} 1 & -1 \\ 1 & 4 \end{pmatrix}$

C) $\begin{pmatrix} 1 & 1 \\ 1 & 4 \end{pmatrix}$ D) $\begin{pmatrix} 1 & 4 \\ -1 & 1 \end{pmatrix}$

39. Let $(X_1, X_2)'$ be a bivariate normal random vector with mean 0 and variance -covariance matrix Σ and correlation ρ. Then, $(X_1, X_2) \stackrel{d}{=} (X_1, -X_2)$ whenever

A) $\rho < 0$ B) $\rho > 0$

C) $\rho = 0$ D) Not depends on ρ

40. To examine whether two different skin creams, A and B, have different effects on the human body, n randomly chosen persons were enrolled in a clinical trial. Then, cream A was applied to one of the randomly chosen arms of each person and cream B to the other. What kind of design is this?

A) CRD B) RBD

C) LSD D) BIBD

41. Consider a linear model with four observations X_1, X_2, X_3, X_4 such that $E(X_1) = A - C$, $E(X_2) = A + B - C$, $E(X_3) = A - C$, $E(X_4) = A - B - C$, where A, B, C, D are parameters. Also, assume that $Var(X_i) = \sigma^2$, $i = 1, 2, 3, 4$. Then,

A) A, B, C are estimable

B) A + C are estimable

C) A – C is estimable and $(X_1 + X_3)/2$ is the BLUE ofA – C

D) B is estimable

42. Consider a 2^3 factorial design laid out in two blocks, each of size 4, as follows.

Block 1 : (1) ab ac bc

Block 2 : a b c abc

Then, ...

A) Main effect a is unconfounded

B) Main effect b is confounded

C) Interaction abc is unconfounded

D) Interaction ab is confounded

43. For which of the following sets of values a BIBD with parameters v, b, r, k, λ does not exist?

(1) v = 11, b = 22, r = 6, k = 3, λ = 1.

(2) v = 21, b = 4, r = 4, k = 21, λ = 4.

(3) v = 7, b = 7, r = 4, k = 4, λ = 2.

(4) v = 7, b = 7, r = 3, k = 3, λ = 1.

A) Only (3) B) Only (1) and (2)

C) Only (2) D) (3) and (4)

44. If a random variable X has probability function $f(x) = \frac{k}{x!}, x = 0,1,2, ...$ the value of k is

A) e B) $\frac{1}{e}$

C) $1+\frac{1}{e}$ D) $1-\frac{1}{e}$

45. Probability is a _____ Function.

A) Point B) Point or Set

C) Set D) None of above

46. The statement $0 \leq X_n \uparrow X$, then $EX_n \uparrow EX$ is due to

A) Dominated Convergence Theorem

B) Fatoe's Lemma

C) Monotone Convergence Theorem

D) Fubini's Theorem

47. Let $(X_1, X_2, ..., X_n)$ be a random sample from Uniform distribution over $(0, \theta)$ and $X_{(n)}$ = Maximum of $(X_1, X_2, ..., X_n)$. Then $\sqrt{n}\,(X_{(n)} - \theta) \xrightarrow{d} -Y$ where Y has

A) Uniform distribution over $(0, \theta)$.

B) Normal distribution with mean zero and variance one.

C) Exponential distribution with mean θ.

D) Normal distribution with mean θ and variance one.

48. Let $(X_1, X_2, ..., X_n)$ be a random sample from $f(x) = \theta x^{\theta-1}$, $0 < x < 1$, $\theta > 0$.

The estimator $T = \dfrac{n}{\sum_{i=1}^{n} \log X_i}$ is

A) Unbiased for θ

B) CAN for θ

C) not an estimator for θ

D) None of the above

49. Let $f(x)$ denote the objective function of an LPP, then

A) $Max\ f(x) = -\ min[-f(x)]$

B) $Max\ f(x) = -\ min[f(-x)]$

C) $Max\ f(x) = -\ min[f(x)]$

D) $Max\ f(x) = min[-f(-x)]$

50. Which of the following statement is correct?

A) If primal has a feasible solution, then its dual will also have a feasible solution.

B) If primal has no feasible solution, then its dual will also have no feasible solution.

C) If both, primal and dual, have feasible solution, then both will have bounded optimal solution.

D) If primal has no feasible solution, then its dual will have an unbounded solution.

Rough Work