M/P ENT - 27

Total No. of Pages : 12

Seat No.	

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

STATISTICS

Day and Date : Saturday, 16- 07 - 2022 **Total Marks : 100**

Time : 2.00 p.m. to 4.00 p.m.

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 making the circles. Do not make any stray mark on the OMR Answer Sheet.**
5) **Follow the instrunctions 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) Which of the following can be considered as 'Creative aspect of reading a research paper?

   A) Thinking whether assumptions made by the author are reasonable

   B) Thinking about the limitations of the solutions which the author has mentioned in the paper.

   C) Thinking about the other applications or extensions that the authors might not have thought of

   D) Thinking whether the author trying to solve the right problem

2) What is a research paradigm?

   A) A scientific theory in any area of science.

   B) A set of practices that defines a scientific discipline at any particular period of time

   C) A new theory developed after an extensive research

   D) A set of equations and their solutions

3) Which of the following cannot be considered as a benefit of an effective literature review?

A) Will provide with the 'conceptual framework' for the research.

B) Will enable to identify the key issues or critical questions that are troubling the research community.

C) Will point towards the gaps that have not been previously been identified or addressed by researchers.

D) Will suggest theories that might explain the data the researcher has gathered from the field

4) Which of the following is not a characterization of an 'Action Research'?

A) Concentration on practical issues

B) An iterative cycle of plan-act-reflect

C) An emphasis on change

D) Single data generation method

5) Which of the following is not true regarding 'consultancy' and 'action research'?

A) Consultants operate under tighter time and budget constraints

B) Both are the same.

C) Consultancy process is usually linear, while the action research process is cyclical

D) Action research require theoretical justifications, while consultants require empirical justifications

6) Connected with 'ethnography', which of the following is not true?

A) Ethnography means a description of peoples and cultures.

B) Ethnography focuses on understanding the culture and ways of seeing of a particular group of people.

C) Observational studies and ethnography are the same.

D) An ethnographer tries to construct a representation of the world as perceived by the people who live in the world.

7) An academic association assembled at one place to discuss the progress of its work and further plans. Such an assembly is known as a

A) Conference
B) Seminar
C) Workshop
D) Symposium

8) A researcher is generally expected to

A) Study the existing literature in a field
B) Generate new principles and theories
C) Synthesize the ideas given by others
D) Evaluate the findings of a study

9) Plagiarism consists of

A) Giving too long quotations
B) Summarizing other researchers' views
C) Receiving guidance from experts other than research supervisor
D) Using other researchers' work without acknowledging it

10) The depth of any research can be judged by

A) Place of the research
B) Objectives of the research
C) Total expenditure on the research
D) Duration of the research

11) When a research problem is related to heterogeneous population, the most suitable sampling method is

A) Cluster sampling
B) Stratified sampling
C) Conventional sampling
D) Lottery method

12) Field study is related to

A) Experimental situation
B) Laboratory situations
C) Real life situations
D) None of these

13) Determine the number of different arrangements of the letters in the word NANAIMO.

A) 210
B) 1260
C) 2520
D) 5040

14) Let A and B be the two matrices. Then rank (AB)=rank (A)if_____

A) B is a square matrix
B) B is a non-singular matrix
C) B is a symmetric matrix
D) B is a skew-symmetric matrix

15) Simpson's $3/8^{th}$ rule for integration gives exact result, when f (x) is a polynomial of degree_____

A) l only
B) 2 only
C) 3 only
D) l, 2 or 3

16) The Newton-Raphson method is used to find the root of the equation $x^2 - 2 = 0$. If the iterations are started from –1, the iteration will_____

A) converge to –1
B) converge to $\sqrt{2}$
C) converge to $-\sqrt{2}$
D) not converge

17) Newton's numerical method for solving systems of nonlinear equations converges with order _____

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

18) Let $X_1, X_2, ... X_8$ be a random sample from the normal distribution with mean θ and variance 1, and let the prior distribution of θ be normal with mean 2 and variance 2. Define $\bar{X} = \frac{1}{8}\sum_{i=1}^{8} X_i$. Then, which of he following statement(s) are true?

1. The prior is a conjugate prior
2. The posterior mean of θ given $\bar{X}$ is $\frac{16\bar{X} + 2}{17}$
3. Under absolute error loss the Bayes estimator is $\frac{16\bar{X} + 2}{17}$
4. The posterior variance of θ given $\bar{X}$ is 1/17

A) Only 1 B) Only 1, 2, 3

C) Only 2, 3 D) All

19) Which of the following methods always converges to root of equation f(x) = 0?

A) Newton-Raphson method B) Regula falsi method

C) Secant method D) None of above

20) Which of the following offers a grid interface that allows the user to organize any type of required information?

A) MS Word B) Powerpoint

C) MS Excel D) Matlab

21) The key properties of random numbers for simulation are

A) Uniform and Dependent B) Uniform and Independent

C) Continuous and Dependent D) Discrete and Dependent

22) Which of the following statistical tests can be used to determine the fit of statistical distribution?

A) F-test
B) Student's t-test
C) Chi-square test
D) Z-test

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

24) Which of the following graphs is to be chosen to show a functional relationship between independent and dependent variable?

A) Bar chart
B) Pie chart
C) Histogram
D) Scatter plot

25) Squaring correlation coefficient yields

A) Coefficient of non determination
B) Coefficient of determination
C) Standardized regression weight
D) Standard error of estimate

26) A city is subdivided into 50 non overlapping blocks. Five blocks are selected at random and completely enumerated. The procedure is

A) Cluster sampling
B) Stratified sampling
C) A partial census
D) None of these

27) The characteristic roots of real symmetric orthogonal matrix are

A) 0 and 1
B) –1 and 1
C) –1 and 0
D) None of the above

28) Let A and B be matrices with rank (A)=p, rank (B)=q, and AB is defined. Then which of the following statement is correct?

A) Rank (AB) = pq
B) Rank (AB) $\leq$ pq
C) Rank (AB) $\leq$ min (p, q)
D) None of these

29) Which of the following statement is true about the sequence of functions $\{f_n(x)\}_{n=1,}^{\infty}$ where $f_n(x) = \frac{nx}{1+n^2x^2}, x \in \mathbb{R}$?

A) $\{f_n(x)\}_{n=1}^{\infty}$ Converges uniformly

B) $\{f_n(x)\}_{n=1}^{\infty}$ Converges pointwise but not uniformly

C) $\{f_n(x)\}_{n=1}^{\infty}$ Does not converge pointwise.

D) $\{f_n(x)\}_{n=1}^{\infty}$ converges uniformly but not pointwise

30) Which of the following statement is true about the series $\sum_{n=1}^{\infty} \frac{x^2}{n}$?

A) The series converges for all $x \in \mathbb{R}$
B) The series converges for all $x \in (0,1)$
C) The series converges only for x=1
D) The series is nowhere convergent

31) What dialog box allows you to change a field name in a PivotTable in MSExcel?

A) Field Options
B) Field Pane
C) Field Settings
D) Field Structure

32) What is a macro used for?

A) To access programs in Excel
B) To create buttons and forms in Excel
C) To automatically complete a series of Excel steps
D) To link Excel files together

33) In testing H_0: $\theta=\theta_0$ in $N(\theta,1)$, the critical region based on n observations is $\sum x_i < c$. For which alternative hypothesis, does this provide UMP test?

A) $\theta \neq \theta_0$ B) $\theta = \theta_0$

C) $\theta < \theta_0$ D) $\theta > \theta_0$

34) A test $\phi(x) = a, \forall x$ is _____test.

A) biased B) unbiased

C) UMP D) UMPU

35) For a branching process $\{X_t, t=0,1,.....\}$ with $X_0=1$, if $E(X_1)=1$ and Var X_1 is σ^2, then the expected value and the variance of the population size at n-th generation are respectively given by

A) n and σ^2 B) 1 and $n\sigma^2$

C) n and $n\sigma^2$ D) 1 and σ^2

36) Let $X_1, X_2,....X_n$ be independent and identically distributed random variables with probability density function.

$f(x,\theta)=1/\theta,\ 0 < x < \theta.$

Let Y=max $(X_1, X_2....X_n)$. Then which of the following is true?

A) If T is unbiased estimator of θ, then Var $(T) \geq \theta^2/n$.

B) Y is an unbiased estimator of θ.

C) $\frac{n}{n+1}Y$ is an unbiased estimator of θ.

D) There exists an unbiased estimator U such that Var $(U) \leq \theta^2/n$.

37) If T is sufficient for $\{f_\theta : \theta \in \Theta\}$, then_____

A) $E_\theta[g(T)]=0$ for all θ.

B) every unbiased estimator of θ is a function of T.

C) T is sufficient for $\{f_\theta : \theta \in \Omega\}$, Where $\Omega \subseteq \Theta$.

D) None of above

38) Let $(X_1, X_2, X_3) \sim N_3(\mu, \sum)$ where

$$\mu = (5, 2, 3) \text{ and } \sum = \begin{pmatrix} 3 & 2 & 1 \\ 2 & 4 & 2 \\ 1 & 2 & 5 \end{pmatrix}$$

Then, which one of the following is a more probable answer for the mean of the conditional distribution of X_2 given $X_1 = x_1$ and $X_3 = x_3$?

A) $1/7(-12 + 2x_3)$ B) $1/7(-12 + 4x_1 + 2x_3)$

C) $1/7(-12 + 4x_1^2 + 2x_3^2)$ D) $1/7\ (4x_1 + 2x_3)$

39) Let (X_1, X_2, X_3) has a 3-variate normal distribution with covariance matrix

$\sum = \begin{pmatrix} 1 & -2 & 0 \\ -2 & 5 & 0 \\ 0 & 0 & 2 \end{pmatrix}$ having eigen values λ_1=5.83, λ_2=2, λ_3=0.17. Then which of the following statements is not true?

A) X_3 is one of the principal components.

B) X_3 is uncorrelated with X_1 and X_2

C) Variance of the first principal component is Y_1 is 5.83

D) Covariance between the first (Y_1) and second (Y_2) Principal components is –2.

40) Consider a randomized block experiment involving ν treatments and *r* blocks. which of the following is true?

A) The variance of the BLUE of any elementary treatment contrast is σ^2/r, where σ^2 is the variance of an observation.

B) The BLUE of a treatment contrast is uncorrelated with the BLUE of a block contrast.

C) If α_i is the effect of i^{th} treatment, i=1, 2,..... ν and β_j is the effect of the j^{th} block, j= 1,2, ... r, then $\alpha_i + \beta_j$ is estimable for each i=1,2,.... ν and j=1, 2....,r.

D) If μ is the general mean and β_j is the effect of the j^{th} block (j=1, 2,...r), then $\mu+\beta_j$ is estimable for each j=1, 2,...r.

41) In one-way ANOVA model $y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$; $i = 1, 2,...k$; $j = 1, 2,...n_i$, the dimension of estimation space is_____

A) $k-1$ B) n_i

C) n_i-1 D) k

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

Block 1 : (1) b ac abc

Block2: a ab c bc

Then,_____

A) Main effect A is confounded.

B) Main effect B and interaction AC are unconfounded.

C) Interaction BC is unconfounded

D) Interaction AB is confounded

43) Suppose that X_n are i i d with geometric pmf $p_k = P(X=k) = pq^{k-1}$, $k = 1, 2,.....$, $0 < p < 1$, $q = 1-p$, $X_{(2)} - X_{(1)}$ has

A) Geometric distribution B) Binomial distribution

C) Poisson distribution D) Negative binomial distribution

44) Suppose X is normally distributed with mean zero and variance one, the variance of X^2 is

A) 4 B) 3

C) 2 D) 1

45) Which of the following statement is false if $P(A) \neq 0$?

A) $P(A|A)=1$ B) $P(B|A) \geq 0$

C) $P(B|A) \geq P(B)$ D) $P(B|A) \geq P(B)/P(A \cup B)$

46) If X_k s are independent, $S_n = \sum_{k=1}^{n} X_k$ and $Var\ (X_k) = \sigma_k^2 < \infty$, then for $b_n \uparrow \infty$, $\sum_{k=1}^{n} \left(\sigma_k^2 / b_k^2 \right) < \infty$ implies

A) $\frac{S_n - ES_n}{b_n} \xrightarrow{p} 0$

B) $\frac{S_n - ES_n}{b_n} \xrightarrow{a.s} 0$

C) $\frac{S_n - ES_n}{b_n} \xrightarrow{p} k$

D) $\frac{S_n - ES_n}{b_n} \xrightarrow{a.s} k$

47) 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 $T = \frac{n}{\sum_{i=1}^{n} \log X_i}$ is

A) Unbiased for θ
B) CAN for θ
C) not an estimator for θ
D) None of the above

48) Let $\{A_n\}$ and $\{B_m\}$ be sequence of tests with same limiting size α and power β. then the Pitman asymptotic relative efficiency of A_n and B_m is the limiting ratio of

A) n and m
B) n and α
C) β and m
D) α and β

49) About an LPP, consider the following two statements

i) If LPP has feasible solution, then it also has a basic feasible solution.
ii) There exists only finite number of basic feasible solutions.

Which of the following statement is true?

A) Both I and II are false
B) Only I is true
C) Only II is true
D) Both I and II are true

50) Consider the following LPP Max $Z = X_1$ Subject to $X_1 + X_2 \leq 1$, $X_1 - X_2 \geq 1$, $X_1 \geq 0$, $X_2 \geq 0$. Then, the basic feasible solution to its dual is

A) Unbounded
B) Infeasible
C) Degenerate
D) Bounded

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Rough Work