Seat No.	

M.Phil./Ph.D. Entrance Examination, August - 2018
STATISTICS

Day and Date : Wednesday, 08 - 08 - 2018   **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) Which of the following statement is correct?
   A) Null hypothesis is non-directional hypothesis
   B) Null hypothesis is directional hypothesis
   C) A statistical hypothesis is not given in statistical term
   D) All the above

2) Which statement is incorrect in the context of qualities of a good research?
   A) good research is replicable
   B) good research is logical
   C) good research is not systematic
   D) good research is empirical

P.T.O.

3) Which is not a feature of good research design?

   A) It should be simple and understandable

   B) It should have the smallest experimental error

   C) It should be non-practicable

   D) It should be accurate.

4) Which type of research is used for solving practical problem?

   A) basic research

   B) applied research

   C) fundamental research

   D) none of these

5) A man has 5 different pets and wishes to photograph them 3 at a time arranged in a line. How many different arrangements are possible?

   A) 60   B) 10

   C) 30   D) 20

6) If G is a g-inverse of A, then _____.

   A) Rank (G) $\leq$ Rank (A)

   B) Rank (G) $\geq$ Rank (A)

   C) Rank (G) = Rank (A)

   D) Rank (G) $\leq$ Rank (AG)

7) ICT stands for_____

   A) Information Common Technology

   B) Information and Communication Technology

   C) Information and Computer Technology

   D) Internet and Computer Technology

8) Satellite Communication works through_____

   A) Transmitter   B) Radar

   C) Receptor   D) Internet

9) INFLIBNET is _____

   A) a central library in India

   B) an autonomous Inter-University centre of UGC

   C) internet facility in library

   D) information about library and internet

10) 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.

11) The depth of any research can be judged by:

   A) Title of the research   B) Objectives of the research

   C) Total expenditure on the research D) Duration of the research

12) Field study is related to:

   A) Experimental situation   B) Laboratory situations

   C) Real life situations   D) None of these

13) In Regula-Falsi method, the first approximation is given by_____

   A) $x_1 = \dfrac{af(b) - bf(a)}{f(b) - f(a)}$ B) $x_1 = \dfrac{bf(b) - af(a)}{f(b) - f(a)}$

   C) $x_1 = \dfrac{bf(a) - af(b)}{f(a) - f(b)}$ D) $x_1 = \dfrac{af(a) - bf(b)}{f(a) - f(b)}$

14) While evaluating the definite integral by Trapezoidal rule, the accuracy can be increased by taking_____

   A)   large number of sub-intervals

   B)   even number of sub-intervals

   C)   h=4

   D)   h as multiple of 3

15) A square matrix whose inverse exists, has_____

   A)   at least two linearly dependent rows

   B)   rank less than its order

   C)   determinant equal to zero

   D)   non zero determinant

16) In how many ways can 8 Indians and 4 American and 4 Englishmen can be seated in a row so that all person of the same nationality sit together?

   A)   3! 4! 8! 4!   B)   3! 8!

   C)   4! 4!   D)   8! 4! 4!

17) What is the purpose of a goodness-of-fit test?

   A)   To find relationships in the data

   B)   To identify significant effects

   C)   To test whether the data is a random sample from a normal distribution

   D)   To test whether the data is a random sample from a specified distribution.

18) In a χ^2 test of independence between sex and kinds of phobias, the null hypothesis was rejected. The proper conclusion is that

   A)   sex and phobias are independent of each other

   B)   sex and phobias are related to each other

   C)   knowing a person's phobia gives no clue to his/her sex

   D)   none of the above

19) If the joint density $f(X_1, X_2, ..., X_n; \theta)$ of n random variables, $X_1, X_2, ..., X_n$ is considered to be a function of θ. Then $L(\theta; X_1, X_2, ..., X_n)$ is called

    A) Maximum Likelihood function   B) Likelihood Function

    C) Log Likelihood Function   D) Marginal Likelihood Function

20) _____is not a analytical method.
    A) Least square estimation of a parameter using differentiation
    B) Simpson's $1/3^{rd}$ rule
    C) Comparing the actual variances of two estimators
    D) Simplex method

21) Simulation can be done_____
    I) using a programming language   II) using a statistical software
    III) using artificial random numbers   IV) using secondary data
    A) I and II only   B) I, II and III only
    C) II and III only   D) I, II, III and IV

22) What is an appropriate graphical tool to know the properties of data measured on interval scale?
    A) Histogram   B) Bar chart
    C) Pie chart   D) None of A, B, C

23) Binary search algorithm cannot be applied to_____
    A) sorted linked list   B) sorted binary trees
    C) sorted linear array   D) pointer array

24) Which of the following is not true?
    A) Jackknife technique is a resampling technique.
    B) Resampling techniques provide inference on a wide range of statistics under very general conditions.
    C) Resampling methods involve constructing hypothetical populations.
    D) Jackknife technique cannot be used for robust confidence interval estimation.

25) An EXCEL command that returns the inverse of the one-tailed probability of the chi-squared distribution is_____

   A) CHIINV ( )   B) CHINV ( )

   C) INVCHI ( )   D) INVCHIDIST ( )

26) Let T be an unbiased estimator of θ and $I(\theta) = E\left[\dfrac{\partial \log L(\theta)}{\partial \theta}\right]^2$. Then Cramer-Rao lower bound for V(T) is _____

   A) $I(\theta)$ B) $\sqrt{I(\theta)}$

   C) $\dfrac{1}{\sqrt{I(\theta)}}$ D) $\dfrac{1}{I(\theta)}$

27) Let X_1, X_2 be a random sample from $U(0,\theta)$, $\theta>0$. MLE of θ is _____

   A) $X_1 + X_2$ B) $X_1 X_2$

   C) Max $\{X_1, X_2\}$ D) Min (X_1, X_2)

28) A test function takes values in_____

   A) $(0,\infty)$ B) $(0, 1)$

   C) $(0, 1]$ D) $[0, 1]$

29) Let X follow $N(0, \sigma^2)$, $\sigma > 0$. The family of distribution of X has MLR property in_____.

   A) X   B) X^2

   C) $-X$ D) $-X^2$

30) Which one of the following is not an example of non-sampling errors?

   A) Measurement error

   B) Refusal by a unit to respond

   C) Editing error

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

31) Let {N(t), t ≥ 0} be a Poisson process with rate λ. Then conditional distribution of N(t) given N(s)=m, for s<t is _____

A) Poisson

B) Truncate Poisson

C) Uniform

D) Binomial

32) Let U~U (0, 1) and 0<p<1 then integer part of $(\log_e(U)/\log_e(1-p))$ is _____

A) Binomial variate

B) Poisson variate

C) Geometric variate

D) Hypergeometric variate

33) Between bisection method and Newton-Raphson method_____

A) the former is efficient than the later

B) the later is efficient than the former

C) it is not possible to compare these two methods

D) the former does not converge but the later always converges

34) The union of two closed sets is_____

A) not necessarily closed

B) always open

C) either closed or open

D) a closed set

35) Supremum of the set $\{x: 0 < x < 1\}$ is_____

A) less than one

B) not unique

C) 1

D) 0

36) Let X and Y be two independent Poisson r.v.s with parameters λ and θ respectively. Then which of the following statements is not correct?

A) $P[X+Y=5]= e^{-(\lambda+\theta)} (\lambda+\theta)^5 / 5!$

B) $P[X \le 5 \mid Y \le 20]=\sum_{i=1}^{5} e^{-\lambda} \lambda^i / i!$

C) $P[X=5 \mid X+Y=10]=\binom{10}{5}(\lambda\theta)^5 / (\lambda+\theta)^{10}$

D) $P[X-Y=5]= e^{-(\lambda-\theta)} (\lambda-\theta)^5 / 5!$

37) Let X be a normal random variable with mean 1 and variance 1. Define events E={$-1 < X < 0$}, F={$2 < X < 3$} and G ={$0 < X < 2$}. Then

A) $P[E] = P[F] = P[G]$ B) $P[E] = P[F] < P[G]$

C) $P[E] = P[G] < P[F]$ D) $P[F] = P[G] < P[E]$

38) Which of the following statements is true?

A) Any arbitrary union of fields is a field.

B) Any arbitrary union of monotone fields is a field.

C) Any arbitrary intersection of fields is a field.

D) Countable union of fields is a field.

39) Which of the following sequences of sets does not converge, where A_n, n=1,2,.........are given by

A) $\left(a-\dfrac{1}{n}, b+\dfrac{1}{n}\right)$

B) $\left(a+(-1)^n \dfrac{1}{n}, b+(-1)^n \dfrac{1}{n}\right)$

C) $\left(a+\sin\dfrac{n\pi}{2}, b-\sin\dfrac{n\pi}{2}\right)$

D) $\left(a-\dfrac{1}{n}, b+\dfrac{1}{n}\right)\cup\left(a+\dfrac{1}{n}, b-\dfrac{1}{n}\right)$

40) The number of extreme points for the set of feasible solutions for the LPP

max. $3x + 4y$

s.t. $2x + 7y \leq 14$; $x \geq 2$; $2y \geq 1$; $x, y \geq 0$

is _____

A) 1   B) 5

C) 4   D) 3

41) For an LPP whose constraints are inconsistent, the set of feasible solutions is_____

A)   a non-empty convex set

B)   an unbounded set

C)   a set with finitely many extreme points

D)   an empty set

42) Canonical correlation is a measure of association between_____

A)   one variable and set of other variables

B)   two sets of variables

C)   two types of variables

D)   none of these

43) The mean vector of $(X_1 + X_2, X_1 - X_2)$ is (10, 0) then mean vector of $(X_1, 2X_1 - X_2)$ is_____

A)   (10, 0)   B)   (5, 5)

C)   (10, 5)   D)   (5, 10)

44) Let X_1, X_2, X_3 be a random sample from U(0, θ). Let $\hat{\theta}_M$ represent moment estimator and $\tilde{\theta}_L$ represent the MLE of θ. Then which of the following is true?

A) $\hat{\theta}_M = \tilde{\theta}_L$ B) $E(\hat{\theta}_M) = E(\tilde{\theta}_L)$

C) $MSE(\hat{\theta}_M) \geq MSE(\tilde{\theta}_L)$ D) $MSE(\hat{\theta}_M) \leq MSE(\tilde{\theta}_L)$

45) Suppose T_n is consistent for θ. Then a Borel function $g(T_n)$ is consistent for $g(\theta)$ if :

A) g is a continuous function

B) g is a bounded function

C) g is a one to one function

D) g is any function

46) The eigen values of a triangular matrix are_____

A) the square-roots of the diagonal elements of the matrix

B) the squares of the diagonal elements of the matrix

C) zero and one

D) the diagonal elements of the matrix

47) Which of the following statements are true?

I) Let A be a square matrix, then trace $(A'A) = 0$ if and only if A is a null matrix.

II) If α is a non-zero scalar and A is a nonsingular matrix, then $(\alpha A)^{-1} = \alpha A^{-1.}$

III) A permutation matrix of order n has *2n* nonzero elements.

IV) Some elements of a reducible matrix are zero.

A) I only

B) I and II only

C) II and III only

D) I and IV only

48) Consider a linear model with three observations X_1, X_2 and X_3 such that $E(X_1)=A+2B$, $E(X_2)=B+2C$, and $E(X_3)=C+2A$, where A, B and C are parameters. Then,_____

A) the dimension of error space is 1.

B) A+2B+3C is estimable

C) A–2B+C is not estimable

D) 2A+B/2–C/3 is not estimable

49) The dimension of estimation space for the model $y_{ij} = \mu + \alpha_i + \beta_j + \varepsilon_{ij}$, $i = 1, 2,...p,\ j=1,2,...q$ is_____

A) $(p-1)(q-1)$

B) $(p+1)(q+1)$

C) $p+q+1$

D) $p+q-1$

50) The totals of the response observations in two replicates of a factorial experiment with two factors A and B each at two levels are, namely, $(1) = 80$, $a = 100$, $b = 60$, and $ab = 90$. Then, the interaction effect AB=_____

A) 2.5

B) 5

C) 12.5

D) 25

✓ ✓ ✓

Rough Work