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COMBINED COMPETITIVE (PRELIMINARY) EXAMINATION, 2012

Serial No. ____

STATISTICS
Code No. 21

A

Time Allowed : Two Hours

Maximum Marks : 300

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
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3. You, have to enter your Roll Number on this Test Booklet in the Box provided alongside. *DO NOT* write *anything else* on the Test Booklet.

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4. This Booklet contains 100 items (questions). Each item comprises *four* responses (answers). You will select *one* response which you want to mark on the Response Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each item.
5. In case you find any discrepancy in this test booklet in any question(s) or the Responses, a written representation explaining the details of such alleged discrepancy, be submitted within three days, indicating the Question No(s) and the Test Booklet Series, in which the discrepancy is alleged. Representation not received within time shall not be entertained at all.
6. You have to mark all your responses ONLY on the separate Response Sheet provided. *See directions in the Response Sheet.*
7. All items carry equal marks. Attempt ALL items. Your total marks will depend only on the number of correct responses marked by you in the Response Sheet.
8. Before you proceed to mark in the Response Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Response Sheet as per instructions sent to you with your Admit Card and Instructions.
9. While writing Centre, Subject and Roll No. on the top of the Response Sheet in appropriate boxes use **"ONLY BALL POINT PEN".**
10. After you have completed filling in all your responses on the Response Sheet and the examination has concluded, you should hand over to the Invigilator only the Response Sheet. You are permitted to take away with you the Test Booklet.

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ROUGH WORK

1. The axiomatic definition of probability was proposed by :
   (A) R.A. Fisher (B) Bernoulli
   (C) Kolmogorov (D) Gauss

2. If $B \subset A$ then it is true that :
   (A) $P(B) \leq P(A)$ (B) $P(B) = 1 - P(A)$
   (C) $P(B) > P(A)$ (D) $P(B) = 0$

3. When three symmetric dice are rolled at a time the chance of getting a sum of the number shown up as 12 will be :
   (A) 1/ 8 (B) 25/216
   (C) 1/12 (D) 8/216

4. The probability of an impossible event is :
   (A) 1/2 (B) 1
   (C) 0 (D) 0.9973

5. The probability obtained by Bayes theorem is :
   (A) Apriori probability (B) Absolute probability
   (C) Conditional probability (D) Posterior probability

6. If F(x) is a Probability Distribution Function then $F(+\infty)$ is :
   (A) 0 (B) 1/2
   (C) 1 (D) –1

7. If X is a continuous random variable then P(X = x) =
   (A) 1 (B) 0
   (C) 0.5 (D) Any value between 0 and 1

8. In the usual notation $f(x,y)/f_1(x)$ is called :
   (A) Conditional density (B) Marginal density
   (C) Joint density (D) Cumulative density

9. If C & K are constants then V(CX + K) =
   (A) CV(X) (B) V(X) + K
   (C) $C^2V(X)$ (D) 0

10. The moment generating function of X is equal to :

(A) $E(e^{itx})$ (B) $E(e^{tx})$

(C) $E(e^{-itx})$ (D) $E(e^{-tx})$

11. The product moment of X and Y is given by :

(A) $E(X) + E(Y)$ (B) $E(XY) - E(X)\,E(Y)$

(C) $E(XY)$ (D) $E(XY) + E(X)E(Y)$

12. If A and B are any two events and $P(A) = 1/4$, $P(B) = 2/5$ and $P(A \cup B) = 1/2$, then $P(A \cap B^C)$ is :

(A) 1/10 (B) 4/5

(C) 3/10 (D) 3/5

13. In the usual notation, $P(X = 0)$ for Binomial Distribution is :

(A) $(1 - p)^n$ (B) p^n

(C) 1 (D) $p(1 - p)$

14. The coefficient of variation of Poisson Distribution with mean '1' will be :

(A) $\sqrt{2}$ (B) 1

(C) $\frac{1}{\sqrt{2}}$ (D) 2

15. If X and Y follows Poisson Distribution with means m_1 and m_2 then the distribution of $(X - Y)$ is :

(A) Poisson with mean $(m_1 + m_2)$ (B) Poisson with mean $(m_1 - m_2)$

(C) Poisson with mean $(m_1 m_2)$ (D) Not Poisson at all

16. A discrete distribution having memoryless property is :

(A) Binomial (B) Hypergeometric

(C) Geometric (D) Negative Binomial

17. The MGF of Poisson distribution with parameter λ is :

(A) $e^{\lambda t - 1}$ (B) $e^{\lambda(e^t - 1)}$

(C) $e^{\lambda(e^{it} - 1)}$ (D) $e^{i\lambda(e^t - 1)}$

18. The variance of continuous uniform distribution between 0 & b is :

(A) $b^2/2$ (B) $b/6$

(C) $b^2/6$ (D) $b^2/12$

19. If an exponential distribution has mean = 2, its variance is :
(A) 4 (B) 1/2
(C) $\sqrt{2}$ (D) 2

20. The number of failures before the r^{th} success in a series of independent Bernoulli trials follows :
(A) Binomial (B) Negative Binomial
(C) Geometric (D) Uniform

21. In the usual notation Gamma (1/2) is equal to :
(A) 1 (B) π
(C) $\sqrt{\pi}$ (D) 0

22. In a normal distribution the area covered between mean and 2 S.Ds. is :
(A) 99.73% (B) 95%
(C) 64.5% (D) 50%

23. The distribution of the sum of n-independent exponential variates will be :
(A) Gamma (B) Exponential
(C) Normal (D) Beta

24. The number of parameters in Bivariate normal is :
(A) 4 (B) 6
(C) 5 (D) 2

25. The limiting distribution used in Central Limit Theorem is :
(A) Beta (B) Normal
(C) Gamma (D) Cauchy

26. Classification of data according to time becomes :
(A) Qualitative (B) Quantitative
(C) Geographical (D) Chronological

27. A class frequency divided by total frequency becomes :
(A) Relative frequency (B) Frequency density
(C) Cumulative frequency (D) Conditional frequency

28. One of the following diagrams is suitable for presenting percentage share of components :
(A) Bar chart (B) Pie chart
(C) Line chart (D) Histogram

29. Cumulative frequencies are necessary to draw :
(A) Histogram (B) Ogive
(C) Line chart (D) Scatter diagram

30. The AM of the values {–1, –2,–3, 3, 2, 1}is :
(A) 6 (B) 1.5
(C) 0 (D) 2

31. In the usual notation the Harmonic Mean is given by :
(A) $\frac{\sum f_i}{\sum (x_i / f_i)}$ (B) $\frac{\sum f_i}{\sum (f_i / x_i)}$
(C) $\frac{\sum (f_i / x_i)}{\sum f_i}$ (D) $\frac{\sum f_i x_i}{\sum f_i}$

32. The standard deviation of {2, 2, 2, 2, 2} is :
(A) $\sqrt{2}$ (B) 2
(C) 0 (D) 4

33. The percentage of data values above the third quartile is :
(A) 25% (B) 50%
(C) 75% (D) 100%

34. For a symmetric distribution, the skewness coefficient is :
(A) 1 (B) 3
(C) 0 (D) –1

35. If the coefficient of Kurtosis is negative, then the distribution is :
(A) Leptokurtic (B) Platykurtic
(C) Mesokurtic (D) Any of these

36. The chart used to understand the nature of correlation is :
(A) Pie chart (B) Ogive
(C) Scatter chart (D) Line chart

37. One of the following is only true about correlation coefficient :

(A) $-1 < r < 1$ (B) $0 \leq r \leq 1$

(C) $-1 \leq r \leq 1$ (D) $-1 \leq r \leq 0$

38. If r = 0.90 then the coefficient determination is :

(A) $\sqrt{0.90}$ (B) $(0.90)^2$

(C) 1/0.90 (D) 1 – (0.90)

39. In the usual notation the relationship between the regression coefficients and correlation coefficient is :

(A) $r = (b_{xy})\,(b_{yx})$ (B) $r = \pm\sqrt{b_{xy}\, b_{yx}}$

(C) $r = \frac{b_{xy}}{b_{yx}}$ (D) $r = \pm\sqrt{\frac{b_{xy}}{b_{yx}}}$

40. The coefficient of association between two independent attributes is equal to :

(A) 1 (B) – 1

(C) 0 (D) 0.50

41. If $X \sim N(\mu, \sigma^2)$ the standard error of $\bar{X} = \sum x / n$ is :

(A) σ^2/n (B) $\sigma^2/\sqrt{n}$

(C) $\sigma/\sqrt{n}$ (D) σ/n

42. Test for goodness of fit is based on :

(A) t - Distribution (B) Normal Distribution

(C) Chi-square distribution (D) F-Distribution

43. For a paired t-test of means with a sample of 20, the degrees of freedom are :

(A) 18 (B) 19

(C) 20 (D) None of these

44. Student's t-test was proposed by :

(A) R.A. Fisher (B) Suedecur

(C) Cochran (D) Gosset

45. The value of skewness for student's t-distribution is :
(A) – 1 (B) 1
(C) 0 (D)

46. For large degrees of freedom the t-distribution tends to :
(A) Normal (B) Chi-square
(C) Log Normal (D) None of these

47. The relationship between t and F statistics is :
(A) $t = F/2$ (B) $t^2 = \sqrt{F}$
(C) $t^2 = F$ (D) $t = 1/F$

48. For a (4×3) contingency table the degrees of freedom for chi-square test of independence, are :
(A) 12 (B) 9
(C) 8 (D) 6

49. In ANOVA the null hypothesis relates to the comparison of :
(A) Means (B) Variances
(C) Proportion (D) Standard deviations

50. One of the following is not an order statistic :
(A) Maximum (B) Mean
(C) Minimum (D) Median

51. Any statistical test is said to be unbiased if for that test :
(A) Power + Size > 0 (B) Power + Size < 0
(C) Power < Size (D) Power > Size

52. If $X \sim N(\mu, \sigma^2)$ and x is the sample size then a sufficient statistic for $\bar{x}$ is :
(A) $(x_n - x_i)$ (B) Σx_i
(C) $\Sigma(x_i - \bar{x})^2$ (D) None of these

53. If t_n is an estimator of θ, then Cramer-Rao's inequality provides a lower bound on :
(A) $V(t_n)$ (B) $E(t_n)$
(C) $Max(t_n)$ (D) $Min(t_n)$

54. For an unbiased estimator t_n, if $V(t_n) \to 0$ as $n \to \infty$, it is called :

(A) Efficient (B) Sufficient

(C) Consistent (D) All these

55. Rao-Blackwell theorem deals with :

(A) Ratio estimation (B) Level of significance

(C) Sufficient Statistic (D) Confidence intervals

56. Let X be a standard Normal random variable and Y is a Chi-square random variable with 3 degrees of freedom. Assuming that random variables X and Y are independently distributed, then distribution of $X/\sqrt{Y/3}$ is :

(A) Chi-square distribution (B) Cauchy distribution

(C) t distribution (D) Normal distribution

57. BLUE stands for :

(A) Best Linear Uniform Estimator (B) Best likelihood Unbiased Estimator

(C) Bayes Linear Unbiased Estimator (D) Best Linear Unbiased Estimator

58. If V_1 is the variance of the most efficient estimator T_1 and V_2 is the variance of any other estimate T_2, then the efficiency T_2 is given by :

(A) V_1/V_2 (B) V_2/V_1

(C) $V_1 - V_2$ (D) $V_2 - V_1$

59. MLE of θ when a sample of 'n' observations is drawn from the population having pdf $f(x) = \theta e^{-x\theta}$; $x \geq 0$ is :

(A) $\bar{x}$ (B) $(\bar{x})^{-1}$

(C) s^2 (D) $(s^2)^{-1}$

60. Number of conditions for mutual independence of n events are :

(A) 2^n (B) $2^n - n - 1$

(C) 3^n (D) $3^n + n + 1$

61. If $\bar{x}$ is the mean of Binomial Distribution B (l, p), then it is :

(A) Sufficient statistic for p (B) Efficient estimator of p

(C) Both (A) and (B) (D) Neither (A) nor (B)

62. The hypothesis $H_1 : \mu > \mu_0$ is :
(A) Right sided (B) Left sided
(C) Two-sided (D) Any of these

63. The set of values of the test statistic, which support the rejection of Null Hypothesis is called :
(A) Power (B) LOS
(C) Critical region (D) Confidence Interval

64. The probability of committing type II Error is denoted by :
(A) α (B) $1 - \alpha$
(C) $1 - \beta$ (D) β

65. In the usual notation the one-sample t-test is based on :
(A) (B) $t = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$
(C) $t = \frac{\bar{x} - \mu}{s\sqrt{n}}$ (D) $t = \frac{\bar{x} - \mu}{\sigma\sqrt{n}}$

66. For large samples the test for comparing two proportions is based on ____ distribution.
(A) Poisson (B) Binomial
(C) Standard Normal (D) t

67. For any one-sided Z-test the critical value at 5% level of significance is equal to :
(A) 1.28 (B) 2.33
(C) 1.96 (D) 1.645

68. The test for comparing two variances for equality is based on :
(A) χ^2-Distribution (B) F-Distribution
(C) Normal Distribution (D) t-Distribution

69. For a two sample t-test for means with $n_1 = 12$ and $n_2 = 10$, the degrees of freedom are :
(A) 12 (B) 10
(C) 20 (D) 21

70. The size of the critical region is known as :
(A) Power of test (B) Critical value
(C) Level of significance (D) Test range

71. For large n, the mean of Wilcoxon's Signed Rank test is :
(A) $n(n + 1)/4$ (B) $n(n +1)/2$
(C) $n(2n +1)/4$ (D) $n(n – 1)/2$

72. The number of runs in the sequence FFFMMM is :
(A) 6 (B) 1
(C) 2 (D) Can't say

73. Wilcoxon test is considered as analogous to :
(A) One-sample t-test (B) Two-sample t-test
(C) Two-sample F-test (D) Goodness of fit test

74. The mean of number of runs U in run test is given by E(U) =
(A) N +2 (B) (N +2)/2
(C) (N +1)/2 (D) N/2

75. The non-parametric test for goodness of fit of a distribution is :
(A) Run test (B) Kolmogorov-Smirnov test
(C) U-test (D) Sign test

76. Prestige bias and self interest of respondent leads to :
(A) Response error (B) Non-response error
(C) Grouping error (D) Standard error

77. Simple Random Sampling is applicable when the population units are :
(A) Clustered (B) Homogeneous
(C) Heterogeneous (D) Few in number

78. Consider a sample of 'n' drawn from a population of size 'N' by simple random sampling. Then, the probability of drawing a specified unit of the population is :
(A) 1/n (B) 1/N
(C) n/N (D) N/n

79. In the context of sampling the fraction n/N is called :
(A) Sampling fraction (B) Sampling frame
(C) Sampling ratio (D) None of these

80. Number of total samples of size n which can be drawn from a population of size N under simple random sampling with replacement is :

(A) n/N (B) N^n

(C) n^N (D) $\binom{N}{n}$

81. The unbiased estimator of population mean $\bar{Y}$ under stratified sampling is :

(A) $\sum \frac{N_h \bar{y}_h}{N}$ (B) $\sum \frac{N_h \bar{Y}_h}{N}$

(C) $\sum \frac{n_h \bar{y}_h}{N}$ (D) $\sum \frac{n_h \bar{y}_h}{n}$

82. In the usual notation one of the following is only true :

(A) $V_{SRS} \geq V_{PROP} \geq V_{OPT}$ (B) $V_{OPT} \geq V_{PROP} \geq V_{SRS}$

(C) $V_{SRS} \geq V_{OPT} \geq V_{PROP}$ (D) None of the above

83. In the usual notation the finite population correction is :

(A) $\frac{N-n}{N}$ (B)

(C) (D)

84. With SRSWOR from a finite population of size N, the variance of proportion is :

(A) (B) $\left(\frac{N-n}{N+1}\right)\left(\frac{PQ}{n}\right)$

(C) $\left(\frac{N-n}{N-1}\right)\left(\frac{pq}{n}\right)$ (D) $\left(\frac{N-n}{N-1}\right)\frac{PQ}{n}$

85. In systematic sampling with k = N/n, k is called :

(A) Sampling interval (B) Sampling frame

(C) Sampling size (D) Sampling ratio

86. In a two way analysis of variance with 4 treatments, 5 blocks and 3 observations per cell, the error degrees of freedom are :

(A) 38 (B) 39

(C) 40 (D) 41

87. A necessary condition for a symmetrical BIBD, assuming the number of treatments as even, is that $(r - \lambda)$ must be :

(A) Perfect Square (B) Infinite

(C) Positive Integer (D) Negative Integer

88. The first census in India was held in :

(A) 1827 (B) 1872

(C) 1892 (D) 1897

89. In the context of census 2010, NPR stands for :

(A) New Population Register (B) National Population Register

(C) National People Register (D) New Population Rolls

90. The statistical test used to compare the means of three or more independent groups is :

(A) Z-test (B) Paired t-test

(C) ANOVA (D) Run Test

91. In 3^3 design the error degrees of freedom with 5 replicates are :

(A) 108 (B) 106

(C) 104 (D) 102

92. The principle used to estimate experimental error is :

(A) Local control (B) Randomization

(C) Replication (D) Blocking

93. Two way ANOVA is used in the analysis of :

(A) RBD (B) CRD

(C) LSD (D) All these

94. In the usual notation the expression for the missing value in a m × m LSD is :

(A) $\frac{m(R+C+T)-2S}{(m+1)(m-2)}$ (B)

(C) (D)

95. In the ascending order of efficiency, the following order of basic designs is true :

(A) CRD, LSD, RBD
(B) CRD, RBD, LSD
(C) RBD, CRD, LSD
(D) RBD, LSD, CRD

96. The error degrees of freedom in a 2^n factorial with r-replicates are :

(A) $(r-1)(2^n)$
(B) $r\,2^n - 1$
(C) $(r-1)(2^n+1)$
(D) $(r-1)(2^n-1)$

97. In the usual notation interaction AB in 2^2 factorial design is given by:

(A) $(a+1)(b-1)/2$
(B) $(a-1)(b+1)/2$
(C) $(a-1)(b-1)/2$
(D) $(a+1)(b+1)/2$

98. In a 2^3 design when ABC interaction is confounded, each block contains ____ treatment combinations.

(A) 8
(B) 2
(C) 4
(D) 3

99. A BIBD is said to be symmetric if :

(A) $b = V$ and $r > K$
(B) $b = V$ and $r < K$
(C) $b < V$ and $r = K$
(D) $b = V$ and $r = K$

100. In a symmetric BIBD the number of treatments common to any two blocks is :

(A) λ^2
(B) $(\lambda+1)$
(C) λ
(D) λ/V

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