

COMMON P. G. ENTRANCE TEST – 2023 (CPET-2023)

Test Booklet No. :

011

Subject Code : **44**

Hall Ticket No. :

Subject : **STATISTICS**

TEST BOOKLET

Time Allowed : **60 Minutes**

Full Marks : **80**

: INSTRUCTIONS TO CANDIDATES :

1. The Test Booklet contains **16** pages including the cover page and **80** (Question No. 1 to 80) multiple choice questions.
2. DO NOT break the seal of the Test Booklet until the invigilator instructs to do so.
3. The candidates must check discrepancy, if any (like up-printed or torn or missing pages or missing questions) in the Test Booklet immediately after breaking the seal of the Test Booklet. If detected, the invigilator may be requested to replace the same.
4. Candidates are required to fill up and darken the **Hall Ticket No, Test Booklet Serial No.** and OMR Answer Sheet Serial No. in attendance sheet carefully. Wrongly filled in OMR Answer Sheet is liable for rejection.
5. Each question has four choices / answers marked (A), (B), (C), (D). Candidate has to select the most appropriate choice / answer to each question and darken the oval completely against the question number provided in the OMR Answer Sheet.
6. Indicate only one choice / answer from the options provided by darkening the appropriate oval in the OMR Answer Sheet. More than one response to a question shall be treated as a wrong answer.
7. Use only **Black Ball Point Pen** for darkening the oval for answering.
8. All the questions are compulsory and they carry equal marks. The total marks scored by a candidate depends on the number of correct choices / answers darkened in the OMR Answer Sheet. There will be no negative marking for wrong answers.
9. No candidate shall be allowed to leave the Examination Hall / Room till all OMR Answer Sheets have been collected by the invigilator.
10. On completion of the entrance test, the original OMR Answer Sheet be handed over to the invigilator. Candidates are allowed to take the second copy of the OMR Answer Sheet along with the used Test Booklet for reference.
11. Candidates are not allowed to carry any personal belongings including electronic devices such as scientific calculator, cell phones, headphones, ear buds, or any other type of devices that allow communication of any kind inside the Examination Room / Hall.
12. The candidates are advised not to scribble or make any mark on the OMR Answer Sheet except marking the answers at the appropriate places and filling up the details required. Rough work, if any, may be done in the blank sheet(s) provided at the end of the Test Booklet.
13. Any malpractice / use of unfair means will lead to your disqualification from the entrance test / admission process and may also lead to appropriate legal action as deemed fit.

DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

PN – 44/9

(Turn over)

Test Booklet No. :

011

Hall Ticket No. :

Subject Code : 141

Subject : STATISTICS

TEST BOOKLET

Time Allowed : 80 Minutes

Time Allowed : 80 Minutes

INSTRUCTIONS TO CANDIDATES

1. The test booklet contains 16 pages including the cover page and the question paper. It is to be used for the purpose of the test only.
2. DO NOT break the seal of the test booklet until the invigilator instructs you to do so.
3. The candidates must check the booklet for any loss or damage to the pages or missing pages. If any loss or damage is found, the candidate must immediately report it to the invigilator. The invigilator may be requested to replace the same.
4. Candidates are required to fill up and darken the Hall Ticket, Test Booklet Serial No. and OMR Answer Sheet No. in appropriate order using a black ballpoint pen. The OMR Answer Sheet is to be filled in OMR Answer Sheet.
5. Each question has four alternative answers marked A, B, C, D. Only one of these is the correct answer. The candidate is required to select the correct answer and darken the circle corresponding to the correct answer. The candidate is not to select more than one answer. If the candidate selects more than one answer, the question will be treated as a wrong answer.
6. The only Black Ball Point Pen for darkening the circle is to be used.
7. All the questions are compulsory and they carry equal marks. The OMR Answer Sheet is to be filled in OMR Answer Sheet. There will be no negative marking for wrong answers.
8. The candidate may be asked to observe the examination rules. Hall Ticket, Test Booklet, OMR Answer Sheet, etc. are to be kept in the invigilator's possession.
9. On completion of the test, the candidate must hand over the OMR Answer Sheet to the invigilator. The candidate is not to take any copy of the OMR Answer Sheet with him/her.
10. The candidate is not allowed to use any calculator or any other electronic device during the test. The candidate is not allowed to use any other writing instrument except a black ballpoint pen.
11. The candidate is not allowed to make any mark on the OMR Answer Sheet except the required marks. The candidate is not allowed to write any word or sentence on the OMR Answer Sheet. The candidate is not allowed to write any word or sentence on the OMR Answer Sheet.
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DO NOT OPEN THIS TEST BOOKLET UNTIL YOU ARE ASKED TO DO SO

1. The Singleton Set (non-zero) is :
 - (A) Linearly Dependent
 - (B) Linearly Independent
 - (C) May or may not be linearly independent
 - (D) Neither A nor B
2. Condition that vectors (a_1, a_2) and (b_1, b_2) are linearly dependent is :
 - (A) $a_1b_1 + a_2b_2 = 0$
 - (B) $a_1b_2 + a_2b_1 = 0$
 - (C) $a_1b_2 - a_2b_1 = 0$
 - (D) $a_2b_1 - a_1b_2 = 0$
3. Variables such as temperature, dates are examples of :
 - (A) Ratio to scale
 - (B) Interval scale
 - (C) Ordinal scale
 - (D) Nominal scale
4. When $\hat{y}_i = y_i$ for each i in a regression model then the value of r^2 would be :
 - (A) $r^2 = Y$
 - (B) $0 \leq r^2 \leq 1$
 - (C) $r^2 = 1$
 - (D) $r^2 = 0$
5. The least square estimators are :
 - (A) Period estimators
 - (B) Point estimators
 - (C) Population estimators
 - (D) Popular estimators
6. The lowest significance level at which a null hypothesis can be rejected is determined by :
 - (A) t-value
 - (B) p-value
 - (C) Significance test
 - (D) Confidence interval
7. When R^2 for a regression model is equal to zero, the F value is equal to :
 - (A) Infinity
 - (B) High positive value
 - (C) Low positive value
 - (D) Zero
8. A purely random process is a stationary series with :
 - (A) Zero variance
 - (B) Zero mean
 - (C) Positive mean
 - (D) Zero mean and zero variance

9. The variance of first 'n' natural numbers is :
- (A) $(n^2 + 1)/12$ (B) $(n + 1)^2/12$
 (C) $(n^2 - 1)/12$ (D) $(2n^2 - 1)/8$
10. If the Quartile deviation of a series is 60, the Mean Deviation of this series from the mean will be :
- (A) 72 (B) 48
 (C) 50 (D) 75
11. If $X \sim \beta(n, p)$, the distribution of $Y = (n - X)$ is :
- (A) $\beta(n, 1)$ (B) $\beta(n, x)$
 (C) $\beta(n, p)$ (D) $\beta(n, q)$
12. If σ_1^2 is the error variance of design - I and σ_2^2 of design - II utilizing the same experimental material, the efficiency of design - I over design - II is :
- (A) $\frac{1}{\sigma_1^2} / \frac{1}{\sigma_2^2}$ (B) $\frac{1}{\sigma_2^2} / \frac{1}{\sigma_1^2}$
 (C) $\frac{\sigma_1^2}{\sigma_2^2}$ (D) $\sigma_1^2 \sigma_2^2$
13. In the field layout of a RBD, the blocks are formed in the direction :
- (A) Parallel to fertility gradient (B) Perpendicular to fertility gradient
 (C) Diagonally to fertility gradient (D) Equal to fertility gradient
14. The method of confounding is a device to reduce the size of :
- (A) Experiments (B) Replications
 (C) Blocks (D) Treatments

15. In the construction of which chart Poisson distribution is used ?
- (A) $\bar{X}$ -chart (B) R-chart
(C) P-chart (D) C-chart
16. Expected sample size of Sequential Probability Ratio Test (SPRT) is called :
- (A) Discrete r.v (B) Continuous r.v
(C) ASN (D) ATI
17. When the lot contains all defectives, the OC function for $P = 1$ is :
- (A) $L(P) = 0$ (B) $L(P) = 1$
(C) $L(P) = \infty$ (D) $L(P) = 2$
18. If Laspeyre's Price Index is 324 and Paasche's Price Index is 144, then Fisher's Ideal Index is :
- (A) 234 (B) 180
(C) 216 (D) 224
19. Harmonic analysis method is based on the function y_t expressed in the form of :
- (A) Taylor's function (B) Harmonic series
(C) Fourier series (D) Maclaurin series
20. Link Relatives in a time series remove the influence of :
- (A) The trend (B) Cyclic variation
(C) Irregular variation (D) Seasonal variation
21. Which of the following relation amongst finite differences is not correct ?
- (A) $\Delta^3 y_{-1} - \Delta^3 y_{-2} = \Delta^4 y_{-2}$ (B) $\Delta^2 y_{-1} - \Delta^2 y_0 = \Delta^3 y_0$
(C) $\Delta y_2 - \Delta y_1 = \Delta^2 y_1$ (D) $y_2 - y_1 = \Delta y_1$

22. The missing value for the following data :

x	y
5	2
10	5
15	?
20	8

by the binomial expansion method is :

- (A) 7 (B) -7
(C) 3 (D) 25/3

23. The relationship between u of Stirling's formula and v in Bessel's formula for interpolation is :

- (A) $u = v + 1$ (B) $u = v - 1$
(C) $u = v - \frac{1}{2}$ (D) $u = v + \frac{1}{2}$

24. If the class frequency in a contingency table are such that the cross products are equal, the coefficient of colligation is equal to :

- (A) 0 (B) -1
(C) 1 (D) ∞

25. Rao-Blackwell Theorem enables us to obtain MVUE through :

- (A) Unbiased estimators (B) Complete statistics
(C) Efficient statistics (D) Sufficient statistics

26. Minimum Chi-square estimators are not necessarily :

- (A) Efficient (B) Consistent
(C) Unbiased (D) Sufficient

27. If $P(A/B) = \frac{1}{4}$ and $P(B/A) = \frac{1}{3}$, then $\frac{P(A)}{P(B)}$ is equal to :

(A) $\frac{3}{4}$

(B) $\frac{7}{12}$

(C) $\frac{4}{3}$

(D) $\frac{1}{12}$

28. A coin is tossed six times. The probability of obtaining heads and tails alternately is :

(A) $\frac{1}{64}$

(B) $\frac{1}{2}$

(C) $\frac{1}{32}$

(D) $\frac{1}{16}$

29. If a r, v x has mean 3 and Standard Deviation 5, then the variance of a variable $Y = 2x - 5$ is :

(A) 45

(B) 100

(C) 15

(D) 40

30. Relative efficiency in non-parametric tests is the ratio of :

(A) Power of two tests

(B) Size of two tests

(C) Size of the samples

(D) Numerical values of the test statistics

31. If the moment generating function of a distribution is $(q + pe^t)^n$, then the variance of the distribution is :

(A) np

(B) pq

(C) npq

(D) pq/n

32. A normal r.v has mean 2 and variance 4. Its fourth central moment μ_4 will be :

(A) 16

(B) 64

(C) 80

(D) 48

33. The value of $\left[\left(\frac{1}{2}\right)\right]$ is :

(A) π

(B) 1

(C) $\sqrt{\pi}$

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

34. If $x = r \cos \theta$, $y = r \sin \theta$, then $\frac{\partial(x, y)}{\partial(r, \theta)}$ is equal to :

(A) x

(B) y

(C) r

(D) θ

35. The value of $\lim_{x \rightarrow 0} \frac{(1+x)^n - 1}{x}$ is :

(A) 1

(B) n

(C) n^n

(D) ∞

36. Which one of the following is not a solution of $\left(\frac{dy}{dx}\right)^2 + x\left(\frac{dy}{dx}\right) - y = 0$?

(A) $x^2 + 4y = 0$

(B) $y = x + 1$

(C) $y + x = 1$

(D) $y^2 - 4x = 0$

37. The integrating factor of $y^2 dx + (1 + xy) dy = 0$ is :

(A) e^y

(B) e^x

(C) e^{xy}

(D) e^{-xy}

38. If the variables are uncorrelated, then the variance-covariance matrix will be a :
- (A) Square matrix (B) Non-singular matrix
(C) Singular matrix (D) Diagonal matrix
39. As the value of $(x - \mu)' \Sigma^{-1} (x - \mu)$ increases, the value of density function :
- (A) Increases (B) Decreases
(C) Remains same (D) Becomes zero
40. The value of 'c' of the mean value theorem, if $f(x) = 2x^2 + 3x + 4$ in $[1, 2]$ is :
- (A) 1 (B) 2
(C) $\frac{3}{2}$ (D) $\frac{2}{3}$
41. If $2^x + 2^y = 2^{x+y}$, then the value of $\frac{dy}{dx}$ at $x = y = 1$ is :
- (A) 1 (B) 2
(C) 0 (D) -1
42. Value of $D^n(ax + b)^n$ is :
- (A) na^n (B) $n! a^n$
(C) nab^n (D) $n! b^n$
43. If in Wilcoxon's - signed rank test, the sample size is large, the statistic T^+ is distributed with mean :
- (A) $\frac{n(n+1)}{4}$ (B) $\frac{n(n+1)}{2}$
(C) $\frac{n(2n+1)}{4}$ (D) $\frac{n(n-1)}{4}$

44. If $f(x, y) = \log(x \tan^{-1} y)$, then $f_{xy} = ?$
- (A) $-1/x^2$ (B) 0
(C) $1/x^2$ (D) $1/x$
45. The range of F variate is :
- (A) $-\infty$ to ∞ (B) 0 to 1
(C) 0 to ∞ (D) $-\infty$ to 0
46. Mode of the χ^2 distribution with n degrees of freedom lies at the point :
- (A) $\chi^2 = m - 1$ (B) $\chi^2 = n$
(C) $\chi^2 = n - 2$ (D) $\chi^2 = \frac{1}{n - 2}$
47. Service time in queueing theory is usually assumed to follow :
- (A) Normal Distribution (B) Poisson Distribution
(C) Erlang Distribution (D) Exponential Distribution
48. If the arrivals are completely random, then what is the probability distribution of number of arrivals in a given time ?
- (A) Negative exponential (B) Binomial
(C) Normal (D) Poisson
49. If a matrix of transition probability is of the order $n \times n$, then the number of equilibrium equations would be :
- (A) n (B) $n - 1$
(C) $n + 1$ (D) $n - 2$
50. Supposing that, in cluster sampling s_w^2 represents the variance within the clusters and s_b^2 between clusters. What is the relation between s_w^2 and s_b^2 ?
- (A) $s_w^2 = s_b^2$ (B) $s_w^2 \geq s_b^2$
(C) $s_w^2 \leq s_b^2$ (D) $s_w^2 > s_b^2$

51. If we have a sample of size n from a population of N units, the finite population correction is :

(A) $\frac{N-1}{N}$

(B) $\frac{n-1}{N}$

(C) $\frac{N-n}{N}$

(D) $\frac{N-n}{n}$

52. The value of $\int_0^1 xe^x dx$ is :

(A) 0

(B) -1

(C) 1

(D) 2

53. In a LPP with ' m ' restrictions in ' n ' variables, the maximum number of basic feasible solutions are :

(A) ${}^nC_{m+1}$

(B) ${}^nC_{m-2}$

(C) ${}^nC_m$

(D) ${}^nC_{m-1}$

54. A variable which has no physical meaning, but is used to obtain an initial basic feasible solution to the LPP is referred to as :

(A) Basic variable

(B) Non-basic Variable

(C) Artificial Variable

(D) Basis

55. A square matrix A is said to be idempotent if :

(A) $A^3 = A$

(B) $A^2 = A$

(C) $A^2 = I$

(D) $A^3 = I$

56. The characteristic roots of the matrix $A = \begin{pmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{pmatrix}$ are :

(A) 2, 1, 7

(B) 3, 2, 8

(C) 2, 2, 8

(D) 2, 1, 8

57. Solve the equation $x^3 - 3x^2 + 4 = 0$, two of its roots being equal :
- (A) 2, 1, -1 (B) 2, 2, -1
(C) 2, 2, 1 (D) 2, 1, 1
58. If the variance of an estimator attains the Cramer-Rao lower bound, the estimator is :
- (A) Most efficient (B) Sufficient
(C) Consistent (D) Admissible
59. Exponential smoothing method of business forecasting utilises weights which are :
- (A) $\ln A \cdot P$ (B) Fixed
(C) $\ln G \cdot P$ (D) Arbitrarily chosen
60. The value of N. R. $R < 1$ is indicative of :
- (A) Increase in population (B) Reduction in population
(C) Constancy in population (D) Stability in population
61. A factorial experiment with 3 factors each at 2 levels is carried out in a RBD with 4 blocks. The number of degrees of freedom for error is :
- (A) 3 (B) 7
(C) 21 (D) 31
62. The central mortality rate m_x in terms of q_x is given by :
- (A) $m_x = \frac{2q_x}{2 + q_x}$ (B) $m_x = \frac{2q_x}{2 - q_x}$
(C) $m_x = \frac{q_x}{2 + q_x}$ (D) $m_x = \frac{q_x}{2 - q_x}$

63. Which of the following is continuous at $x = 0$?

(A) $f(x) = \frac{1}{x}$

(B) $f(x) = \frac{|x|}{x}$

(C) $f(x) = |x|$

(D) $f(x) = \frac{x}{|x|}$

64. If x is a r.v. and $f(x)$ is its p.d.f, $E\left(\frac{1}{x}\right)$ is used to find :

(A) A. M

(B) H. M

(C) G. M

(D) 1st central moment

65. The errors emerging out of faulty planning of surveys are categorised as :

(A) Non-sampling errors

(B) Non-response errors

(C) Sampling errors

(D) Absolute error

66. Given the information $(AB) = 76$, $(A\beta) = 98$, $(\alpha\beta) = 228$ and $N = 300$, One finds that :

(A) The data are insufficient to draw any conclusion

(B) The data are consistent

(C) The data are inconsistent

(D) More data needed

67. While analysing the data of a $K \times K$ Latin Square, the error degrees of freedom in ANOVA is equal to :

(A) $(K - 1)(K - 2)$

(B) $K(K - 1)(K - 2)$

(C) $K^2 - 2$

(D) $K^2 - K - 2$

68. If we multiply Y by 1000, the recalculated regression coefficient of Y on X will :

(A) Increase by 1000 times

(B) Decrease by 1000 times

(C) Remain the same

(D) Increase by $\left(\frac{1}{1000}\right)$ times

69. What is the number of degrees of freedom for a simple bivariate linear regression with 100 observations ?
- (A) 100 (B) 97
(C) 98 (D) 2
70. Population census data is an example of :
- (A) Cross-sectional data (B) Time series data
(C) Pooled data (D) Panel data
71. 'C' language provides statements that can alter the flow of a sequence of instructions. These statements are called :
- (A) control statements (B) jumping statements
(C) break statement (D) continue statement
72. C functions can be classified into :
- (A) Two categories (B) Three categories
(C) Four categories (D) Five categories
73. For testing that a bivariate random sample has come from an uncorrelated population, the appropriate test is :
- (A) Normal deviate test (B) χ^2 test
(C) F test (D) t-test
74. Neyman-Pearson lemma provides :
- (A) An unbiased test (B) A most powerful test
(C) An admissible test (D) Minimax test
75. Most of the non-parametric methods utilise measurements on :
- (A) Interval scale (B) Ratio scale
(C) Ordinal scale (D) Nominal scale

76. If the correlation coefficient between the variables X and Y is ρ , the correlation coefficient between x^2 and y^2 is :
- (A) ρ (B) ρ^2
(C) 0 (D) 1
77. The necessary and sufficient condition for the three planes, x_1 on x_2, x_3 ; x_2 on x_1, x_3 and x_3 on x_1, x_2 is :
- (A) $r_{12} + r_{23} + r_{13} - 2r_{12} r_{13} r_{23} = 1$
(B) $r_{12}^2 + r_{13}^2 + r_{23}^2 - 2r_{12} r_{13} r_{23} = 1$
(C) $r_{12}^2 + r_{13}^2 + r_{23}^2 - 2r_{12} r_{13} r_{23} = 0$
(D) $r_{12}^2 + r_{13}^2 + r_{23}^2 - 2r_{12} r_{13} r_{23} > 1$
78. If the two lines of regression in a bivariate distribution are $x + 9y = 7$ and $y + 4x = 16$, then $\sigma_x : \sigma_y$ is :
- (A) 3 : 2 (B) 2 : 3
(C) 9 : 4 (D) 4 : 9
79. If $y = f(x)$ and the values of $f(x)$ for given x are, $f(1) = 14, f(2) = 12, f(5) = 6$ and $f(8) = 21$, $f(7)$ is :
- (A) 2 (B) 12
(C) -8 (D) 6
80. In India, Census is conducted by the office of :
- (A) Director General (B) Registrar General of India
(C) Deputy Director General (D) Director of SSB



SPACE FOR ROUGH WORK

SEAL

aglasem