

Roll No.

Question Booklet Number

O. M. R. Serial No.

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M. Sc. (Second Semester)
(NEP) EXAMINATION, 2025-26
STATISTICS
(Sampling Theory)

| Paper Code | | | | | | |
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Questions Booklet
Series

A

Time : 1:30 Hours]

[Maximum Marks : 75

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

(Only for Rough Work)

1. The specific group of individuals or units under study is known as the :
 - (A) Sample
 - (B) Population
 - (C) Sampling frame
 - (D) Cluster
2. Which approach treats the finite population as a realization of a random process ?
 - (A) Fixed-population approach
 - (B) Super-population approach
 - (C) Bayesian approach
 - (D) Deterministic approach
3. A list of all sampling units available for selection is the :
 - (A) Parameter
 - (B) Statistic
 - (C) Sampling frame
 - (D) Census
4. Complete enumeration of all units in a population is called :
 - (A) Sampling
 - (B) Pilot survey
 - (C) Census
 - (D) Stratification
5. Which is a distinctive feature of finite population sampling ?
 - (A) Mean is always zero
 - (B) Sampling without replacement induces dependence between units
 - (C) Population size is infinite
 - (D) Standard error is never calculated
6. In probability sampling, the probability of selecting a unit is :
 - (A) Zero
 - (B) Known and non-zero
 - (C) Unknown
 - (D) Constant only
7. The Ratio method of estimation uses :
 - (A) Only the study variable
 - (B) Auxiliary variables
 - (C) Non-probability units
 - (D) Random numbers only
8. Ratio estimators are most efficient when the relationship between Y and X is :
 - (A) A straight line through the origin
 - (B) A parabola
 - (C) A horizontal line
 - (D) Random

9. The Regression method of estimation is generally more precise than the Ratio method if :
- (A) The regression line does not pass through the origin
 - (B) The correlation is zero
 - (C) The sample size is 1
 - (D) No auxiliary variable is used
10. Sampling error occurs because :
- (A) The researcher is biased
 - (B) Only a part of the population is studied
 - (C) The sampling frame is perfect
 - (D) The census was not conducted
11. Which of the following is an auxiliary variable ?
- (A) The main variable under study
 - (B) A secondary variable correlated with the study variable
 - (C) A constant value
 - (D) The sample size
12. The bias of a ratio estimator decreases as :
- (A) Sample size decreases
 - (B) Sample size increases
 - (C) Auxiliary variable is ignored
 - (D) The population becomes smaller
13. In the fixed-population approach, population values are considered :
- (A) Random variables
 - (B) Fixed constants
 - (C) Imaginary
 - (D) Infinite
14. The main objective of sampling theory is to :
- (A) Count every unit
 - (B) Develop meaningful inferences about the population
 - (C) Increase the cost of surveys
 - (D) Eliminate all types of errors
15. Which design gives every possible sample of size n an equal probability of selection ?
- (A) Judgement sampling
 - (B) Simple Random Sampling (SRS)
 - (C) Quota sampling
 - (D) Convenience sampling
16. The ratio estimator is biased in :
- (A) Small samples
 - (B) Large samples only
 - (C) All cases
 - (D) Never

17. A 'Sampling Plan' is adopted to :
- (A) Suit different situations
 - (B) Avoid mathematics
 - (C) Ensure census completion
 - (D) Replace auxiliary variables
18. The variance of the regression estimator depends on :
- (A) The correlation coefficient P
 - (B) The alphabetical order of units
 - (C) The time of the survey
 - (D) None of the above
19. If the regression of Y on X is linear, the regression estimator is :
- (A) Always biased
 - (B) Unbiased or nearly unbiased
 - (C) Less efficient than SRS
 - (D) Exactly equal to the population total
20. Which is NOT a basic concept in sampling ?
- (A) Sample size
 - (B) Precision
 - (C) Standard error
 - (D) Complete enumeration
21. Standard error is the standard deviation of :
- (A) The population
 - (B) The sampling distribution of an estimator
 - (C) The auxiliary variable
 - (D) The non-sampling error
22. Probability sampling designs are also known as :
- (A) Scientific sampling
 - (B) Purposive sampling
 - (C) Haphazard sampling
 - (D) Non-random sampling
23. The advantage of sampling over complete enumeration is :
- (A) Reduced cost
 - (B) More time-consuming
 - (C) Lower accuracy in all cases
 - (D) Required for small populations only
24. Auxiliary variables are used to :
- (A) Increase sampling error
 - (B) Increase the precision of estimates
 - (C) Complexify the study
 - (D) Decrease the sample size to zero
25. In the super-population approach, the model assumes that population values y_i are :
- (A) Always equal to the population mean
 - (B) Realizations of independent random variables
 - (C) Determined by a census count
 - (D) Non-random fixed constants

26. In cluster sampling, the sampling units are :
- Individual elements
 - Groups of elements
 - Auxiliary variables
 - Stages
27. Equal size cluster sampling assumes :
- Each cluster has a different number of units
 - Each cluster has the same number of units
 - Clusters are not used
 - Only one cluster exists
28. Intra-class correlation coefficient (ρ) measures the degree of :
- Homogeneity within clusters
 - Correlation between the mean and total
 - Error in the frame
 - Relationship between stages
29. Cluster sampling is more efficient than SRS if ρ is :
- Positive
 - Negative
 - Exactly 1
 - Zero
30. If $\rho = 1$, the units within a cluster are :
- Completely different
 - Identical
 - Randomly distributed
 - Independent
31. In two-stage sampling, the first stage involves selecting :
- Elements
 - Primary Sampling Units (PSUs)
 - Secondary Sampling Units (SSUs)
 - Auxiliary variables
32. The second stage of two-stage sampling involves selecting :
- PSUs
 - SSUs from the selected PSUs
 - The entire population
 - A new frame
33. Two-stage sampling is preferred when :
- A complete list of all elements is available
 - A list of elements is not available, but a list of clusters is available
 - The population is very small
 - Census is required
34. The estimator of the population mean in cluster sampling is :
- The mean of cluster means
 - The sum of all units
 - The auxiliary mean
 - Always biased

35. The variance of the cluster sampling estimator increases as :
- ρ increases
 - ρ decreases
 - Cluster size decreases
 - Efficiency increases
36. Relative efficiency of cluster sampling compared to SRS depends on :
- Cluster size and ρ
 - The name of the researcher
 - The colour of the units
 - The regression constant
37. In two-stage sampling with equal SSUs, the total number of units in the sample is :
- $n + m$
 - $n \times m$
 - n/m
 - M^2
38. The standard error in cluster sampling measures :
- The precision of the estimator
 - The non-sampling error
 - The population size
 - The bias of the frame
39. Comparison of cluster sampling with SRS is often expressed in terms of :
- Variance ratio
 - Mean difference
 - Total count
 - Frame size
40. A cluster is considered 'heterogeneous' if :
- Its units are very similar
 - Its units are very different
 - It contains only one unit
 - It is the same as a stratum
41. Which of the following is a PSU in a survey of students ?
- A student
 - A school
 - A textbook
 - A pen
42. In two-stage sampling, the variance has :
- One component
 - Two components (between PSUs and within PSUs)
 - No components
 - Only non-sampling error
43. If all units in a cluster are selected, the design is :
- Single-stage cluster sampling
 - Two-stage sampling
 - Multi-stage sampling
 - SRSWOR

44. The intra-class correlation coefficient is usually :
- (A) Negative in nature
 - (B) Small and positive in natural populations
 - (C) Greater than 1
 - (D) Less than -1
45. To estimate the population total in cluster sampling, we multiply the cluster mean by :
- (A) Sample size
 - (B) Total number of clusters (N)
 - (C) Total number of elements (NM)
 - (D) ρ
46. Efficiency of cluster sampling increases if clusters are :
- (A) Large and homogeneous
 - (B) Small and heterogeneous
 - (C) Large and heterogeneous
 - (D) Identical to the population
47. Two-stage sampling is a special case of :
- (A) Multistage sampling
 - (B) SRS
 - (C) Systematic sampling
 - (D) Census
48. In the context of the syllabus, M usually denotes :
- (A) The number of clusters
 - (B) The number of units within a cluster
 - (C) The population mean
 - (D) The regression slope
49. Variance of the mean in two-stage sampling involves :
- (A) S_b^2 and S_w^2
 - (B) Only S_b^2
 - (C) Only S_w^2
 - (D) None of the above
50. In two-stage sampling, if only one SSU is selected from each PSU ($m = 1$), the within-PSU variance component (S_w^2) in the estimator's variance is :
- (A) Still present and contributes to total variance
 - (B) Eliminated
 - (C) Maximized
 - (D) Subtracted from the between-PSU variance

51. Multistage sampling is an extension of :
- (A) SRS
 - (B) Two-stage sampling
 - (C) Ratio estimation
 - (D) Census
52. PPS sampling stands for :
- (A) Probability Proportional to Size
 - (B) Population Proportional Sample
 - (C) Primary Probability Selection
 - (D) Periodic PPS
53. In PPS sampling, a unit with a larger size has :
- (A) A smaller chance of selection
 - (B) A larger chance of selection
 - (C) Zero chance of selection
 - (D) The same chance as a small unit
54. The 'Cumulative Sum Method' is used for :
- (A) Calculating variance
 - (B) Selecting a PPS sample
 - (C) Estimating non-response
 - (D) Ordering estimators
55. Lahiri's method is a technique for :
- (A) PPS selection without calculating cumulative totals
 - (B) Ratio estimation
 - (C) Randomized response
 - (D) Regression analysis
56. PPSWR stands for :
- (A) PPS With Replacement
 - (B) PPS Without Replacement
 - (C) PPS Weekly Report
 - (D) Primary Population SRS
57. PPSWOR refers to :
- (A) PPS With Replacement
 - (B) PPS Without Replacement
 - (C) PPS With Odds Ratio
 - (D) None of the above
58. Which of the following is an application of multistage sampling ?
- (A) Large scale national surveys
 - (B) Small lab experiments
 - (C) Weighing a single object
 - (D) Tossing a coin
59. In PPS sampling, 'size' usually refers to :
- (A) A known auxiliary variable.
 - (B) The date of the survey
 - (C) The name of the unit
 - (D) Random numbers
60. The Hansen-Hurwitz estimator is associated with :
- (A) PPSWR
 - (B) SRSWOR
 - (C) Systematic sampling
 - (D) Census

61. Selecting districts, then villages, then households is an example of :
- (A) Single stage sampling
 (B) Multistage sampling
 (C) Ratio estimation
 (D) Regression estimation
62. The probability of selecting the i^{th} unit in PPS is :
- (A) $\frac{1}{N}$
 (B) $\frac{X_i}{\sum X_i}$
 (C) $\frac{n}{N}$
 (D) Constant
63. PPS sampling is generally more efficient than SRS if :
- (A) Size is negatively correlated with study variable
 (B) Size is positively correlated with study variable
 (C) Size is zero
 (D) No correlation exists
64. Which method uses a random number r such that $1 \leq r \leq \text{Total Size}$?
- (A) Cumulative sum method
 (B) Lahiri's method
 (C) SRS
 (D) Judgement sampling
65. Lahiri's method involves selecting a pair of random numbers :
- (A) (i, j) where i is the unit index and j is a random value
 (B) (x, y)
 (C) (n, N)
 (D) $(0, 1)$
66. Multistage sampling helps in reducing :
- (A) Field costs
 (B) Sampling error always
 (C) The number of stages to zero
 (D) The need for any frame
67. In PPS sampling, the estimator of the population total is :
- (A) Unbiased
 (B) Always biased
 (C) Only for size 2
 (D) Not possible to calculate
68. The variance of the PPSWR estimator depends on :
- (A) The variability of (Y_i/P_i)
 (B) The sample size n only
 (C) The population total only
 (D) The alphabetical order

69. If Y_i is exactly proportional to P_i , the variance of the PPS estimator is :
- (A) Infinite
 (B) Zero
 (C) 1
 (D) Negative
70. Comparing PPS with SRS, PPS is better when :
- (A) Y varies significantly with unit size
 (B) Units are all the same size
 (C) Y is a constant
 (D) The frame is missing
71. A major disadvantage of PPSWOR is :
- (A) It is too easy
 (B) Estimation formulas are complex
 (C) It is the same as SRS
 (D) It never uses auxiliary variables
72. The multiplier $1/(nP_i)$ is used in :
- (A) SRS
 (B) PPS estimator
 (C) Cluster sampling
 (D) Regression estimation
73. In Lahiri's method, if the random number is greater than the size of the selected unit :
- (A) Keep the unit
 (B) Reject and select another
 (C) Stop the survey
 (D) Divide by 2
74. Multistage sampling is flexible because :
- (A) Different methods can be used at different stages
 (B) It requires no mathematics
 (C) It is always a census
 (D) It only has one unit
75. Which of the following is the primary advantage of multistage sampling in large-scale surveys ?
- (A) It allows for sampling without a complete frame of the final elements
 (B) It eliminates non-sampling error entirely
 (C) It is always more efficient than SRS in terms of variance
 (D) It treats all units as having equal probability of selection automatically

76. Desraj's estimator is an example of an :
- (A) Unordered estimator
 - (B) Ordered estimator
 - (C) Unbiased ratio estimator
 - (D) Infinite estimator
77. Murthy's estimator is usually discussed for sample size :
- (A) $n = 2$
 - (B) $n = 100$
 - (C) Infinite n
 - (D) $n = 0$
78. Murthy's estimator is generally more efficient than Desraj's because it is :
- (A) Ordered
 - (B) Unordered
 - (C) Based on SRS
 - (D) Used in census
79. The Horvitz-Thomson (HT) estimator is used for :
- (A) PPSWR
 - (B) Any probability sampling design (PPSWOR)
 - (C) Only SRS
 - (D) Judgement sampling
80. The HT estimator is unbiased for :
- (A) Population total
 - (B) Sample variance only
 - (C) Population size only
 - (D) Non-sampling error
81. Which of the following is a 'Sampling Error' ?
- (A) Misinterpretation of questions
 - (B) Error due to using a sample instead of population
 - (C) Data entry error
 - (D) Non-response
82. Non-sampling errors can occur in :
- (A) Only samples
 - (B) Only censuses
 - (C) Both (A) and (B)
 - (D) None of the above
83. Incomplete surveys where some units do not respond lead to :
- (A) Sampling error
 - (B) Non-response error
 - (C) Perfect accuracy
 - (D) Frame error

84. The Hansen and Hurwitz Technique is used to deal with :
- (A) PPS sampling
 - (B) Non-response
 - (C) Large populations
 - (D) Cluster mean
85. The Randomized Response Technique (RRT) is used for :
- (A) Sensitive questions (e.g., illegal acts)
 - (B) Measuring height
 - (C) Counting houses
 - (D) Estimating cluster mean
86. Warner's method is a specific type of :
- (A) Regression estimation
 - (B) Randomized response technique
 - (C) PPS selection
 - (D) Ordered estimation
87. Observational errors are a type of :
- (A) Non-sampling error
 - (B) Sampling error
 - (C) Calculation error only
 - (D) Formula error
88. Which is a source of non-sampling error ?
- (A) Defective sampling frame
 - (B) Random selection
 - (C) Small sample size
 - (D) Use of HT estimator
89. The HT estimator requires knowledge of :
- (A) Only the sample mean
 - (B) Inclusion probabilities (π_i)
 - (C) The name of the unit
 - (D) The census total
90. If all inclusion probabilities are equal, the HT estimator reduces to :
- (A) $N \times$ sample mean
 - (B) Zero
 - (C) The ratio estimator
 - (D) The regression estimator
91. Non-sampling errors generally :
- (A) Decrease with sample size
 - (B) Increase with sample size
 - (C) Stay constant
 - (D) Are always zero
92. Hansen-Hurwitz (1946) suggested a 'sub-sampling' method for :
- (A) Non-respondents
 - (B) Respondents
 - (C) The frame
 - (D) The clusters

93. Desraj's estimator for $n = 2$ involves :
- (A) Two components based on the order of selection
 - (B) One component
 - (C) The population mean
 - (D) No variance
94. The advantage of Warner's method is that it :
- (A) ensures respondent privacy
 - (B) is faster than SRS
 - (C) eliminates sampling error
 - (D) uses auxiliary variables
95. 'Incomplete surveys' refers to :
- (A) Surveys with missing data/non-response
 - (B) Surveys with no errors
 - (C) A complete census
 - (D) PPS sampling
96. Which of the following is NOT a specialized estimator in the syllabus ?
- (A) Desraj's estimator
 - (B) Murthy's estimator
 - (C) Horvitz-Thomson's estimator
 - (D) Maximum Likelihood estimator
97. The HT estimator is unique because it uses :
- (A) Random weights
 - (B) Reciprocal of inclusion probabilities
 - (C) The alphabet
 - (D) Only the first unit
98. Non-sampling errors are also known as :
- (A) Random errors
 - (B) Administrative/Operational errors
 - (C) Sampling fluctuations
 - (D) Standard errors
99. The inclusion probability π_{ij} of two units i and j is used to calculate the variance of :
- (A) Systematic mean only
 - (B) The Hansen-Hurwitz estimator
 - (C) Desraj's first stage estimator
 - (D) The Horvitz-Thomson estimator
100. In Warner's Randomized Response Technique, if P is the probability of the sensitive question being asked, the estimate of the proportion π is unbiased if :
- (A) $P \neq 0.5$
 - (B) $P = 0.5$
 - (C) $P = 1$
 - (D) $P = 0$

(Only for Rough Work)

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

Example :

Question :

- Q. 1 (A) ● (C) (D)
Q. 2 (A) (B) ● (D)
Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. : On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

- प्रश्न 1 (A) ● (C) (D)
प्रश्न 2 (A) (B) ● (D)
प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्ण : प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।