Roll No. .....

Question Booklet Number

O. M. R. Serial No. | | | | | | | |

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

Paper Code							
B	0	6	0	8	0	3	T

Questions Booklet Series
D

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. In two-stage sampling, if only one SSU is selected from each PSU (m = 1), the within-PSU variance component $\left(S_{w^2}\right)$ 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

2. 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

3. 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

4. Two-stage sampling is a special case of :

   (A) Multistage sampling

   (B) SRS

   (C) Systematic sampling

   (D) Census

5. 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

6. 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

7. 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

8. If all units in a cluster are selected, the design is :

(A) Single-stage cluster sampling

(B) Two-stage sampling

(C) Multi-stage sampling

(D) SRSWOR

9. In two-stage sampling, the variance has :

(A) One component

(B) Two components (between PSUs and within PSUs)

(C) No components

(D) Only non-sampling error

10. Which of the following is a PSU in a survey of students ?

(A) A student

(B) A school

(C) A textbook

(D) A pen

11. A cluster is considered 'heterogeneous' if :

(A) Its units are very similar

(B) Its units are very different

(C) It contains only one unit

(D) It is the same as a stratum

12. Comparison of cluster sampling with SRS is often expressed in terms of :

(A) Variance ratio

(B) Mean difference

(C) Total count

(D) Frame size

13. The standard error in cluster sampling measures :

(A) The precision of the estimator

(B) The non-sampling error

(C) The population size

(D) The bias of the frame

14. In two-stage sampling with equal SSUs, the total number of units in the sample is :

(A) $n + m$

(B) $n \times m$

(C) n/m

(D) M^2

15. Relative efficiency of cluster sampling compared to SRS depends on :

(A) Cluster size and ρ

(B) The name of the researcher

(C) The colour of the units

(D) The regression constant

16. The variance of the cluster sampling estimator increases as :

(A) ρ increases

(B) ρ decreases

(C) Cluster size decreases

(D) Efficiency increases

17. The estimator of the population mean in cluster sampling is :

(A) The mean of cluster means
(B) The sum of all units
(C) The auxiliary mean
(D) Always biased

18. Two-stage sampling is preferred when :

(A) A complete list of all elements is available
(B) A list of elements is not available, but a list of clusters is
(C) The population is very small
(D) Census is required

19. The second stage of two-stage sampling involves selecting :

(A) PSUs
(B) SSUs from the selected PSUs
(C) The entire population
(D) A new frame

20. In two-stage sampling, the first stage involves selecting :

(A) Elements
(B) Primary Sampling Units (PSUs)
(C) Secondary Sampling Units (SSUs)
(D) Auxiliary variables

21. If $\rho = 1$, the units within a cluster are :

(A) Completely different
(B) Identical
(C) Randomly distributed
(D) Independent

22. Cluster sampling is more efficient than SRS if ρ is :

(A) Positive
(B) Negative
(C) Exactly 1
(D) Zero

23. Intra-class correlation coefficient (ρ) measures the degree of :

(A) Homogeneity within clusters
(B) Correlation between the mean and total
(C) Error in the frame
(D) Relationship between stages

24. Equal size cluster sampling assumes :

(A) Each cluster has a different number of units
(B) Each cluster has the same number of units
(C) Clusters are not used
(D) Only one cluster exists

25. In cluster sampling, the sampling units are :

(A) Individual elements
(B) Groups of elements
(C) Auxiliary variables
(D) Stages

26. 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

27. 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

28. 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

29. Probability sampling designs are also known as :

(A) Scientific sampling

(B) Purposive sampling

(C) Haphazard sampling

(D) Non-random sampling

30. 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

31. Which is NOT a basic concept in sampling ?

(A) Sample size

(B) Precision

(C) Standard error

(D) Complete enumeration

32. 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

33. 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

34. A 'Sampling Plan' is adopted to :

(A) Suit different situations

(B) Avoid mathematics

(C) Ensure census completion

(D) Replace auxiliary variables

35. The ratio estimator is biased in :

(A) Small samples

(B) Large samples only

(C) All cases

(D) Never

36. 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

37. 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

38. In the fixed-population approach, population values are considered :

(A) Random variables

(B) Fixed constants

(C) Imaginary

(D) Infinite

39. 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

40. 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

41. 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

42. 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

43. 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

44. The Ratio method of estimation uses :

(A) Only the study variable

(B) Auxiliary variables

(C) Non-probability units

(D) Random numbers only

45. In probability sampling, the probability of selecting a unit is :

(A) Zero

(B) Known and non-zero

(C) Unknown

(D) Constant only

46. 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

47. Complete enumeration of all units in a population is called :

(A) Sampling

(B) Pilot survey

(C) Census

(D) Stratification

48. A list of all sampling units available for selection is the :

(A) Parameter

(B) Statistic

(C) Sampling frame

(D) Census

49. 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

50. The specific group of individuals or units under study is known as the :

(A) Sample

(B) Population

(C) Sampling frame

(D) Cluster

51. 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) $P = 0$

52. 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

53. Non-sampling errors are also known as :

(A) Random errors

(B) Administrative/Operational errors

(C) Sampling fluctuations

(D) Standard errors

54. The HT estimator is unique because it uses :

(A) Random weights

(B) Reciprocal of inclusion probabilities

(C) The alphabet

(D) Only the first unit

55. Which of the following is NOT a specialized estimator in the syllabus ?

(A) Desraj's estimator

(B) Murthy's estirnator

(C) Horvitz-Thomson's estimator

(D) Maximum Likelihood estimator

56. 'Incomplete surveys' refers to :

(A) Surveys with missing data/non-response

(B) Surveys with no errors

(C) A complete census

(D) PPS sampling

57. 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

58. 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

59. Hansen-Hurwitz (1946) suggested a 'sub-sampling' method for :

(A) Non-respondents

(B) Respondents

(C) The frame

(D) The clusters

60. Non-sampling errors generally :

(A) Decrease with sample size

(B) Increase with sample size

(C) Stay constant

(D) Are always zero

61. If all inclusion probabilities are equal, the HT estimator reduces to :

(A) N × sample mean

(B) Zero

(C) The ratio estimator

(D) The regression estimator

62. 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

63. Which is a source of non-sampling error ?

(A) Defective sampling frame

(B) Random selection

(C) Small sample size

(D) Use of HT estimator

64. Observational errors are a type of :

(A) Non-sampling error

(B) Sampling error

(C) Calculation error only

(D) Formula error

65. Warner's method is a specific type of :

(A) Regression estimation

(B) Randomized response technique

(C) PPS selection

(D) Ordered estimation

66. 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

67. The Hansen and Hurwitz Technique is used to deal with :

(A) PPS sampling

(B) Non-response

(C) Large populations

(D) Cluster mean

68. Incomplete surveys where some units do not respond lead to :

(A) Sampling error

(B) Non-response error

(C) Perfect accuracy

(D) Frame error

69. Non-sampling errors can occur in :

(A) Only samples

(B) Only censuses

(C) Both (A) and (B)

(D) None of the above

70. 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

71. The HT estimator is unbiased for :

(A) Population total

(B) Sample variance only

(C) Population size only

(D) Non-sampling error

72. The Horvitz-Thomson (HT) estimator is used for :

(A) PPSWR

(B) Any probability sampling design (PPSWOR)

(C) Only SRS

(D) Judgement sampling

73. 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

74. Murthy's estimator is usually discussed for sample size :

(A) $n = 2$

(B) $n = 100$

(C) Infinite n

(D) $n = 0$

75. Desraj's estimator is an example of an :

(A) Unordered estimator

(B) Ordered estimator

(C) Unbiased ratio estimator

(D) Infinite estimator

76. 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

77. 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

78. 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

79. The multiplier $1/(nP_i)$ is used in :

(A) SRS

(B) PPS estimator

(C) Cluster sampling

(D) Regression estimation

80. 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

81. 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

82. If Y_i is exactly proportional to P_i, the variance of the PPS estimator is :

(A) Infinite

(B) Zero

(C) 1

(D) Negative

83. The variance of the PPSWR estimator depends on :

(A) The variability of (Yi/Pi)

(B) The sample size n only

(C) The population total only

(D) The alphabetical order

84. 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

85. 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

86. 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) $(0, 1)$

87. Which method uses a random number r such that $1 \leq r \leq$ Total Size ?

(A) Cumulative sum method

(B) Lahiri's method

(C) SRS

(D) Judgement sampling

88. 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

89. 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

90. Selecting districts, then villages, then households is an example of :

(A) Single stage sampling

(B) Multistage sampling

(C) Ratio estimation

(D) Regression estimation

91. The Hansen-Hurwitz estimator is associated with :

(A) PPSWR

(B) SRSWOR

(C) Systematic sampling

(D) Census

92. 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

93. 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

94. PPSWOR refers to :

(A) PPS With Replacement

(B) PPS Without Replacement

(C) PPS With Odds Ratio

(D) None of the above

95. PPSWR stands for :

(A) PPS With Replacement

(B) PPS Without Replacement

(C) PPS Weekly Report

(D) Primary Population SRS

96. Lahiri's method is a technique for :

(A) PPS selection without calculating cumulative totals

(B) Ratio estimation

(C) Randomized response

(D) Regression analysis

97. The 'Cumulative Sum Method' is used for :

(A) Calculating variance

(B) Selecting a PPS sample

(C) Estimating non-response

(D) Ordering estimators

98. 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

99. PPS sampling stands for :

(A) Probability Proportional to Size

(B) Population Proportional Sample

(C) Primary Probability Selection

(D) Periodic PPS

100. Multistage sampling is an extension of :

(A) SRS

(B) Two-stage sampling

(C) Ratio estimation

(D) Census

(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 छाँटना 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।