Sikkim Public Service Commission

Main Written Examination for the Post of Sub Inspector

PAPER - II STATISTICS

Time allowed: 3.00 Hrs | Maximum Marks: 250

INSTRUCTION TO CANDIDATES

Read the instructions carefully before answering the questions: -

1. **IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.**
2. **Use only Black Ball Point Pen to fill the OMR Sheet.**
3. Do not write anything else on the OMR Answer Sheet except the required information.
4. **This Test Booklet contains 50 questions in MCQ Mode in Part I to be marked in OMR Sheet. Part II and Part III are Subjective Questions which have to be written on separate answer sheet provided to you.**
5. Before you proceed to mark in the Answer Sheet (OMR), you have to fill in some particulars in the Answer Sheet (OMR) as per given instructions.
6. After you have completed filling in all your responses on the Answer Sheet (OMR) and the examination has concluded, you should hand over the Answer Sheet (OMR) and separate answer sheet to the Invigilator only. You are permitted to take with you the Test Booklet.
7. **Marking Scheme**

   THERE WIL BE NEGATIVE MARKING FOR WRONG ANSWERS MARKED BY A CANDIDATE IN THE OBECTVE TYPE QUESTIONS

   i. There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, one-third of the marks assigned to the question will be deducted as penalty.

   ii. If a candidate gives more than one answer, it will be treated as a wrong answer even if one of the given answers happens to be correct and there will be same penalty as above to the question.

   iii. If a question is left blank. i.e., no answer is given by the candidate; there will be no penalty for that question.

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

PART - I

Choose the correct answer for the following questions: **(3x50=150)**

1. In its plural sense, the word 'statistics' means:

A. A branch of study dealing with data collection, compilation, analysis and interpretation.
B. Aggregation of data
C. Both A and B
D. None of these

2. Statistics is a tool

A. to prove anything
B. to disprove anything
C. to analyze the data to derive the conclusion
D. None of these

3. In the development of statistical methods, the greatest contribution is that of

A. Economists
B. Mathematicians
C. Businessmen
D. Scientists

4. The real giant in the development of the theory of statistics is

A. Fisher
B. Gauss
C. Bowley
D. Karl Pearson

5. Statistics can best be considered as

A. An art
B. A science
C. Both art as well as science
D. Neither art nor science

6. When population under investigation is infinite, we should use the

A. Sampling method
B. Census method
C. Either census or sampling method
D. None of these

7. Sampling errors are present only in

A. Complete enumeration (census)
B. Sample survey
C. Both census and sample surveys
D. Neither census nor sample surveys

8. The term 'bias' in statistics refers to

A. Duplication of records
B. omission of records
C. under coverage of units
D. the difference between the value of a statistic and that of the corresponding population parameter

9. Precision of a random sample

A. Decreases with increase in sample size
B. Remains constant with increase in sample size
C. Increases with the increase in the sample size
D. None of these

10. Non-sampling errors do not include

A. Duplication of records
B. Omission of records
C. Under coverage of units
D. Faulty sampling design

11. Which of these is not a measure of central tendency?

A. Median
B. Mean
C. Variance
D. Mode

12. Which of the following is not a measure of dispersion?

A. Standard deviation
B. Mean absolute deviation
C. Proportion
D. Interquartile deviation

13. What is the range of Karl Pearson's correlation coefficient (r)?

A. -1 to +1
B. 0 to 1
C. 0.1 to 1.0
D. -1 to 0

14. When the coefficient of skewness is zero, the distribution is:

A. J shaped
B. U Shaped
C. Symmetrical
D. L-Shaped

15. When $\beta_2 < 3$, the distribution is:

A. Leptokurtic
B. Platykurtic
C. Mesokurtic
D. None of these

16. In a negatively skewed distribution:

A. mode<median<mean
B. Median>mode>mean
C. Mode>median>mean
D. None of these

17. γ_2 is:

A. $\beta_2 + 3$
B. $\beta_1 - 3$
C. $\beta_2 - 3$
D. None of these

18. The term 'kurtosis' means:

A. lack of symmetry
B. peakedness /flattedness of a distribution
C. Spread in the data
D. Central value of the data

19. If a frequency distribution is positively skewed, the mean of the distribution is

A. Greater than the mode
B. Less than the mode
C. Equal to the mode
D. None of these

20. When coefficient of skewness is negative

A. $Q3 + Q1 = 2Q_2$
B. $Q3 + Q1 < 2Q_2$
C. $Q3 + Q1 > 2Q_2$
D. None of these

21. The regression lines cut each other at the point of

A. Average of X and Y
B. Average of X only
C. average of Y only
D. The median of X and Y

22. The regression line of Y on X is represented by:

A. Y=a+bX
B. X=a+bY
C. both (a) and (b)
D. none of these

23. In case of perfect positive correlation, the regression lines will

A. cut each other at 90°
B. cut each other at 30°
C. cut each other at 60°
D. coincide

24. Where r is zero the regression lines cut each other making an angle of

A. 30º
B. 60º
C. 90º
D. None of these

25. The product of both the regression coefficients b_{xy} and b_{yx} gives the value of:

A. r
B. r^2
C. $\sqrt{r}$
D. none of these

26. In calculation of chain index numbers, the base year is kept

A. fixed
B. variable
C. either (a) or (b)
D. none of these

27. Laspeyre's price index is based on

A. Base year quantities
B. Current year quantities
C. both of them
D. Average of current and base year

28. Fisher's ideal index is

A. Arithmetic mean of Laspeyre's and Paasche's index
B. Median of Laspeyre's and Paasche's index
C. Geometric mean of Laspeyre's and Paasche's index
D. None of these

29. Time reversal test is satisfied when

A. $P_{01} \times P_{10} = 0$
B. $P_{01} \times P_{10} = 1$
C. $P_{01} \times P_{10} > 1$
D. $P_{01} \times P_{10} < 1$

30. In life table q_x is calculated by the formula

A. lx/dx
B. lx/ex
C. dx/tx
D. tx/lx

31. In life tables expectation of life at x, i.e., e^x

A. lx/Tx
B. Tx/lx
C. dx/Tx
D. Tx/lx

32. For comparing the health condition of two towns we have to calculate

A. Crude death rate
B. Crude birth rate
C. Standardized birth rate
D. Standardized death rate

33. If Gross Reproduction Rate is more than 1, it indicates

A. Population would increase
B. Population would decrease
C. Population would neither increase nor decrease
D. None of these

34. If Net Reproductive Rate = 1, the population will have a tendency

A. to increase
B. to decrease
C. to remain constant
D. none of these

35. Probability of an event always lies between

A. 0 to 1
B. -1 to 1
C. 0 to 5
D. 0 to ∞

36. The classical school of thought on probability assumes that all possible outcomes of an experiment are

A. Equally likely
B. Independent
C. Mutually exclusive
D. none of these

37. If an event cannot take place, the probability will be

A. +1
B. -1
C. 0
D. None of these

38. p×q would always be

A. Less than one
B. More than one
C. Zero
D. One

39. If two events A and B are independent, the conditional probability that they will both occur is given by

A. P (A) + P (B)
B. P (A) × P (B)
C. P (A) — P (B)
D. P (A) × P (B) + P (AB)

40. $^5C_2$ is equal to

A. 20
B. 10
C. 30
D. 100

41. If P (A∩B) is equal to 0.24 and P (B) is equal to 0.60 then P (A/B) is

A. 0.16
B. 0.36
C. 0.40
D. None of these

42. The standard deviation of Binomial distribution is

A. $\sqrt{(nqp)}$
B. npq
C. $n^2p^2q^2$
D. np

43. The variance of Poisson distribution with parameter 'm' is

A. m^2
B. m
C. $m^2 + 3m$
D. $m+m^2$

44. If in case of Poisson distribution $\mu_2 = 3.2$, its mean will be

A. 2.4
B. 3
C. 3.2
D. 6.8

45. In case of normal distribution β_2

A. Zero
B. 2
C. Less than 3
D. 3

46. In case of normal distribution μ_4

A. 3
B. $3\sigma_4$
C. $3\sigma^2$
D. 0

47. Standard error of proportion of successes (p) is given by

A. $\sqrt{(pq/n)}$
B. $\sqrt{(npq)}$
C. npq
D. $\sqrt{(np/q)}$

48. Large sample theory is applicable when

A. $N > 30$
B. $N < 30$
C. $N \geq 30$
D. N is at least 100

49. While testing significance of the differences of two sample means in case of small independent samples, the degrees of freedom is calculated by

A. $v = n_1 + n_2$
B. $v = n_1 + n_2 - 1$
C. $v = n_1 + n_2 - 2$
D. $v = n_1 - n_2+2$

50. When the observed and the expected frequencies completely coincide, χ^2 will be

A. +1
B. -1
C. Greater than 1
D. Zero

PART - II

Attempt ANY TWO of the following: **(25X2=50)**

1. Distinguish between the 'census' and 'sampling methods of collection of data, and compare their merits and demerits. Why is sampling method unavoidable in certain situations?

2. What is skewness? What are the tests of skewness? Draw different sketches to indicate different types of skewness and locate roughly the relative positions of mean, median and mode in each case.

3. Explain briefly the various types of non-parametric tests known to you and the specific situations in which they are applicable.

4. Define probability. Briefly explain the different schools of thoughts on probability.

5. Distinguish between crude death rate and statistics death rate. How are the two calculated? What is the advantage of using standardized death rates?

PART - III

Write short notes on ANY FIVE of the following: **(10X5=50)**

1. Define a random sample and show how you would achieve randomness. How do you select a random sample from a finite population? Also point out the advantages of a stratified random sample.

2. Prepare a sample survey scheme for ascertaining the percentage of income of household spent on food. In what respects your scheme will be optimal?

3. Write short-notes on:

   (i) Mann-Whitney U-Statistic
   (ii) Willcoxon-Signed rank test

4. When is the sign test used? The scores under two conditions obtained by the respondents are given below:

X:	12	16	18	8	6	4	11
Y:	7	12	14	17	5	12	8

5. What is χ^2 test? What are its various applications? Explain with examples.

6. Explain the concept of standard error. How is it useful in testing of hypotheses?

7. A random sample of 400 members is found to have a mean of 4.45 cm. Can it be regarded a sample from large population whose mean is 5 cm. and whose variance is 4? [Diff./S.E. = 5.5]

8. What is Poisson distribution? Point out its role.