Question Booklet No. ....

INSTRUCTIONS TO CANDIDATES

(Use only *blue/black ball-point pen* in the space above and on both sides of the Answer Sheet)

1. Within 10 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.

2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope.*

3. A separate Answer Sheet is given. *It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.*

4. Write your *Roll Number and Serial Number of the Answer Sheet by pen* in the space provided above.

5. *On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.*

6. No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR sheet and also Roll No. and OMR sheet No. on the Question Booklet.

7. Any changes in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfairmeans.

8. Each question in this Booklet is followed by four alternative answers. *For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle in the corresponding row of the Answer Sheet, by ball-point pen as mentioned in the guidelines given on the first page of the Answer Sheet.*

9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.

10. *Note that the answer once filled in ink cannot be changed.* If you *do not wish to attempt* a question, leave all the circles in the corresponding row blank (such question will be awarded zero marks).

11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.

12. Deposit *only the OMR Answer Sheet* at the end of the Test.

13. You are not permitted to leave the Examination Hall until the end of the Test.

14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण-पृष्ठ पर दिये गये हैं ।]

Total No. of Printed Pages : 22

No. of Questions : 150

प्रश्नों की संख्या : 150

Time : 2½ *Hours*]   [*Full Marks* : 450

समय : 2½ घण्टे]   [पूर्णांक : 450

Note : (1) Attempt as many questions as you can. Each question carries 3 marks. One mark will be deducted for each incorrect answer. *Zero* mark will be awarded for each unattempted question.

अधिकाधिक प्रश्नों को हल करने का प्रयत्न करें। प्रत्येक प्रश्न 3 अंक का है। प्रत्येक गलत उत्तर के लिए एक अंक काटा जाएगा। प्रत्येक अनुत्तरित प्रश्न का प्राप्तांक **शून्य** होगा।

(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

यदि एकाधिक वैकल्पिक उत्तर सही उत्तर के निकट प्रतीत हों, तो निकटतम सही उत्तर दें।

1. The data given as 5, 8, 10, 11, 13, 15 will be called as :
   (1) time series
   (2) an individual series
   (3) a continuous series
   (4) a discrete series

2. Which of the following variables which are measured on a nominal scale.
   (1) Age categorized as young, middle-aged or old
   (2) Ethnic group
   (3) Social class (I/II/III – N/III – M/IV/V)
   (4) Height in cm

3. If standard deviation of Hb levels of two groups of children are equal, then the mean of both the groups :
   (1) will not be equal
   (2) will also be necessarily equal
   (3) may not be necessarily equal
   (4) will be equal to zero

(1)   P. T. O.

4. In a set of 6 observations 8, 12, 40, 15, 35, 25 the value of median is : ·
   (1) 20　　　　　(2) 15　　　　　(3) 40　　　　　(4) 25

5. Data can be well displayed or represented by way of.:
   (1) cross classification
   (2) two or more dimensional table
   (3) stem and leaf display
   (4) all the above

6. A frequency distribution can be :
   (1) discrete
   (2) continuous
   (3) both (1) and.(2)
   (4) none of (1) and (2)

7. In an ordered series, the data are :
   (1) in descending order
   (2) in ascending order
   (3) either (1) or (2)
   (4) neither (1) or (2)

8. Choice of a particular chart depends on :
   (1) the purpose of the study
   (2) the nature of data
   (3) the type of audience
   (4) all the above

9. If the birth weight of each 10 babies born in a hospital in a day is found to be 2.8 kg then standard deviation of this sample will be :
   (1) 28　　　　　(2) 2.8　　　　　(3) 1　　　　　(4) 0

10. In a bar diagram, the base line is :
    (1) horizontal
    (2) vertical
    (3) false base line
    (4) any of the above

11. Pie-chart represents the components of a factor by : .
    (1) percentages　　(2) angles　　(3) sectors　　(4) circles

12. The most.appropritate diagram to represent the data relating to the monthly expenditure on different items by a family is :
    (1) histogram
    (2) pie-diagram
    (3) frequency polygon
    (4) line graph

13. Histogram can be used only when :
   (1) class intervals are equal or unequal
   (2) class intervals are all equal
   (3) class intervals are unequal
   (4) frequencies in class intervals are equal

14. For a positively skewed data :
   (1) mean < median
   (2) mean = median
   (3) mean > median
   (4) median = 2 mean

15. For a certain moderately skewed distribution mean = 24.5 and median = 26.3. Its mode is :
   (1) 1.8
   (2) 25.4
   (3) 50.8
   (4) 29.9

16. In a distribution, if mean = 3.8, mode = 1.2 and standard deviation = 2.0, then the coefficient of skewness is :
   (1) 0.6
   (2) 1.3
   (3) 1.9
   (4) 2.6

17. If the first and third quartiles are 30 and 70 respectively then the coefficient of dispersion will be :
   (1) 0.4
   (2) 7/3
   (3) 3/7
   (4) 50

18. The positional measure of central tendency is :
   (1) Median
   (2) Arithmetic mean
   (3) Harmonic mean
   (4) Geometric mean

19. A normal distribution will necessarily have :
   (1) one mode
   (2) two modes
   (3) three modes
   (4) four modes

20. If the coefficient of kurtosis r_2 of a distribution is zero, the frequency curve is :
   (1) leptokurtic
   (2) platykurtic
   (3) mesokurtic
   (4) none of these

(3)

P.T.O.

21. A person goes to office at the speed of 10 km/hour and returns home at the speed of 15 km/hour. His average speed is :

(1) 12.5　　　　(2) 12　　　　(3) 13　　　　(4) 14

22. Arithmetic mean of the regression coefficients is greater than :

(1) The correlation coefficient

(2) Double of the correlation coefficient

(3) Unity

(4) The half

23. If regression lines are $8x - 10y + 66 = 0$ and $40x - 18y = 198$, then the correlation coefficient between x and y is :

(1) 0.5　　　　(2) 0.6　　　　(3) -0.6　　　　(4) 0.8

24. The coefficient of correlation between x and y is 0.6. Their covariance is 4.8. The variance of x is 9. The standard deviation of y is :

(1) $\dfrac{4.8}{3 \times 0.6}$　　　　(2) $\dfrac{0.6}{4.8 \times 3}$　　　　(3) $\dfrac{3}{4.8 \times 0.6}$　　　　(4) $\dfrac{4.8}{9 \times 0.6}$

25. Variance of two independent variates x and y are same. The correlation coefficient between x and $(x - y)$ is :

(1) 0　　　　(2) $\dfrac{1}{\sqrt{2}}$　　　　(3) $\dfrac{1}{2}$　　　　(4) 1

26. Given $r_{12} = 0.6$, $r_{13} = 0.5$ and $r_{23} = 0.8$, the value of $r_{12.3}$ is :

(1) 0.4　　　　(2) 0.72　　　　(3) 0.38　　　　(4) 0.47

27. There will be only one regression line in case of two variables if :

(1) $r = +1$ only　　　　　　　　(2) $r = -1$ only

(3) r is either $+1$ or -1　　　　(4) $r = 0$ only

28. When one regression coefficient is negative the other would be :

(1) negative　　　(2) positive　　　(3) zero　　　(4) none of these

29. In a trivariate population $r_{12} = 0.7$, $r_{13} = 0.6$ and $r_{23} = 0.5$, then the value of $R_{1.23}$ is :

(1) 0.57　　　　(2) 0.84　　　　(3) 0.74　　　　(4) 0.50

(4)

30. If the regression of y on x and that of x on y are given by $2y = -4x + 6$ and $16x = -2y + 6$ respectively, then the correlation coefficient between x and y is :

(1) -0.9 (2) $\frac{1}{\sqrt{2}}$ (3) 0.25 (4) -0.5

31. The standard error is :
(1) error in measurement
(2) observer error
(3) measure of variation in sampling means
(4) measure of variation in quantitative observations

32. Weight at birth of randomly selected 100 newborn babies follows normal distribution with mean 2800 gm. and standard deviation 300 gm. How many newborn babies are expected to have weight more than 2500 gm.

(1) 95   (2) 84   (3) 68   (4) 32

33. The differences in weight of newborn babies are to be tested in three groups of gestation, the best test is :
(1) Z-test   (2) t-test
(3) paired t-test   (4) analysis of variance

34. After the study 900 randomly selected Indian pregnant women it was estimated that 36% were anaemic, then the standard error of the estimate is :

(1) 4.8%   (2) 3.2%   (3) 2.6%   (4) 1.6%

35. What is the value of 'n' for Bionomial distribution with mean = 3 and variance = 2 ?

(1) 12   (2) 6   (3) 3   (4) 4

36. Which distribution does not possess the additive property in general ?
(1) Poisson   (2) Normal   (3) Gamma   (4) Binomial

37. Which of these are the suitable condition for the Poisson distribution to be a limiting case of Bionomial distribution :
(1) $n \to \infty, p \to 0$
(2) $n \to \infty, p \to 1, np \to \lambda$ is finite +ive real number
(3) $n \to \infty, p \to 0, np \to \lambda$ is finite +ive real number
(4) $n \to \infty, p \to 0, np \to \lambda$ is an infinite +ive real number

(5)   P.T.O.

38. For negative Binomial distribution, which of these is a correct statement ·

(1) mean > variance

(2) mean = variance

(3) mean < variance

(4) mean is always zero

39. The mean and variance of a distribution is same, then the distribution is :

(1) Normal

(2) Poisson

(3) Uniform

(4) Binomial

40. Given that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{4}$, $P(A|B) = \frac{1}{6}$, the probability $P(B|A)$ is equal to :

(1) $\frac{1}{8}$

(2) $\frac{1}{6}$

(3) $\frac{2}{3}$

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

41. A probability curve $y = f(x)$ range from 0 to ∞. If $f(x) = e^{-x}$, the mean of the distribution is :

(1) 2

(2) 1

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

(4) $\frac{1}{4}$

42. For the following probability density function :

$$f(x) = c\, x^2\, (1 - x), 0 < x < 1$$

The value of constant 'c' is :

(1) 13 ·

(2) 11

(3) 12

(4) 14

43. A continuous random variable x has the probability density function :

$$f(x) = A + Bx, 0 \le x \le 1$$

If the mean of the distribution is $\frac{1}{2}$, then the values of (A, B) is :

(1) $(1, 0)$

(2) $\left(\frac{1}{2}, 0\right)$

(3) $(0, 1)$

(4) $\left(0, \frac{1}{2}\right)$

44. Two dice are tossed. The probability that the sum of the points on the dice is greater than 8, is :

(1) $\frac{5}{36}$

(2) $\frac{11}{36}$

(3) $\frac{7}{36}$

(4) $\frac{5}{18}$

45. The probability of getting a son is 0.5, then the probability of getting all daughters in three deliveries is :

(1) 0.50

(2) 0.125

(3) 0.250

(4) 0.80

46. Joint probability distribution function $F(x, y)$ lies within the limits :

(1) $-1 \le F(x, y) \le 1$ (2) $-1 \le F(x, y) \le 0$

(3) $-\infty \le F(x, y) \le 0$ (4) $0 \le F(x, y) \le 1$

47. If the joint probability density function of X and Y is :

$$f(x, y) = \frac{1}{2}(3 - x - y); \ 0 \le x \le 1, 0 \le y \le 1$$

then the marginal probability density function of Y is :

(1) $f_Y(y) = 3$ (2) $f_Y(y) = \frac{1}{2}\left(\frac{5}{2} - y\right)$

(3) $f_Y(y) = 3 - y$ (4) $f_Y(y) = y - \frac{5}{2}$

48. A random variable X has uniform distribution over the interval $[-1, 3]$. The variance of X is :

(1) $\frac{8}{5}$ (2) $\frac{13}{4}$ (3) $\frac{4}{3}$ (4) $\frac{7}{2}$

49. Given that if $P(A) = \frac{1}{3}$, $P(B) = \frac{3}{4}$ and $P(A \cup B) = \frac{11}{12}$, then $P(B|A)$ is :

(1) $\frac{1}{6}$ (2) $\frac{4}{9}$ (3) $\frac{1}{2}$ (4) $\frac{1}{3}$

50. Let the joint probability mass function of (X, Y) be :

$$f(x, y) = \frac{x + y}{21}, \ x = 1, 2, 3; y = 1, 2$$

$$= 0, \quad \text{otherwise}$$

then $P(X = 3)$ is :

(1) $\frac{3}{7}$ (2) $\frac{4}{9}$ (3) $\frac{1}{3}$ (4) $\frac{4}{7}$

51. The Bionomial distribution :

(1) is the distribution of a continuous random variable

(2) is always symmetrical

(3) is used for making inferences about proportions

(4) can be used to approximate the Normal distribution in certain circumstances

(7)   P.T.O.

52. Which distribution is the proportion of individuals with a disease who are successfully treated with a new drug likely to follow ?

(1) F-distribution

(2) Normal distribution

(3) Poisson distribution

(4) Bionomial distribution

53. The value of $P(X > 1)$ for the following function is :

x	:	0	1	2	3
$P(x)$	:	0.1	0.3	0.5	0.1

(1) 0.6

(2) 0.9

(3) 1

(4) 0.4

54. Given the joint probability density function of x and y as :

$$f(x, y) = 4xy, \, 0 \le x < 1, 0 \le y < 1$$

$$= 0, \quad \text{otherwise}$$

the $P\left(0 < x < \frac{1}{2}, \frac{1}{2} \le y < 1\right)$ is equal to :

(1) $\frac{3}{8}$

(2) $\frac{3}{16}$

(3) $\frac{5}{16}$

(4) $\frac{1}{4}$

55. A random variable X has the following probability mass function :

x	:	-2	-1	0	1	2	3
$P(x)$	:	0.1	k	0.2	$2k$	0.3	k

the mean of X is :

(1) 0.6

(2) 0.5

(3) 0.8

(4) 0.25

56. If $E(\text{statistic}) = \text{Parameter}$, then statistic is said to be :

(1) negatively biased estimate

(2) positively biased estimate

(3) an unbiased estimate

(4) none of these

57. Let $F_{(n_1, n_2)}$ represent an F-variate with n_1 and n_2 degrees of freedom. If $n_1 = n_2$, the median of F-distribution is at :

(1) $F = \frac{1}{2}$

(2) $F = 2$

(3) $F = 1$

(4) $F = 1.5$

58. In case of 4×3 contingency table, the degree of freedom for χ^2-statistic is :

(1) 7　　　　　　(2) 3　　　　　　(3) 4　　　　　　(4) 6

59. Which of the following hypothesis testings is based on F-statistic ?

(1) $\sigma_1^2 = \sigma_2^2$　　　(2) $\rho_1 = \rho_2$　　　(3) $\mu = \mu_0$　　　(4) $\sigma^2 = \sigma_0^2$

60. The mode of the F-distribution is always :

(1) greater unity　　　　　　　　(2) less than unity.

(3) zero　　　　　　　　　　　　(4) -1

61. The standard error of observed sample proportion 'p' is :

(1) $\dfrac{PQ}{n}$　　　(2) $\dfrac{\sqrt{PQ}}{n}$　　　(3) $\sqrt{\dfrac{PQ}{n}}$　　　(4) $\dfrac{PQ}{\sqrt{n}}$

62. The test associated with the comparison of more than two means is :

(1) t-test　　　(2) Z-test　　　(3) χ^2-test　　　(4) F-test

63. To test the goodness of fit the following test may be used :

(1) Chi-square test　(2) F-test　　　(3) t-test　　　(4) Z-test

64. The probability of type-II error is :

(1) β　　　　(2) α　　　　(3) $1 - \beta$　　　(4) $1 - \alpha$

65. The probable limits for population proportion 'P' are given by :

(1) $p \pm q$　　　(2) $p \pm 2\sqrt{\dfrac{pq}{n}}$　　　(3) $p \pm 3\sqrt{\dfrac{pq}{n}}$　　　(4) $q \pm 3\sqrt{\dfrac{pq}{n}}$

66. For a two-tailed test if $|Z| > 1.96$, $H_0 : \mu = \mu_0$ is :

(1) accepted at 5% level of significance

(2) rejected at 5% level of significance

(3) accepted at 1% level of significance

(4) rejected at 1% level of significance

67. For practical purposes, sample may be regarded as large if :

(1) $n < 30$　　(2) $5 < n < 30$　　(3) $n > 30$　　(4) none of these

(9)　　　　　　　　　　　　　　　　　　P.T.O.

47. In plants that fix nitrogen symbiotically, deficiency of this element leads to reduced nitrogen fixation

   (1) Mo   (2) Mn   (3) Cu   (4) Zn

48. A facultative parasite

   (1) is essentially a saprophyte but can also live as a parasite

   (2) always lives as a parasite

   (3) never causes disease in a host

   (4) can only live as a saprophyte

49. A clear area in the lawn of growing bacterial cells initiated upon bacteriophage infection is called

   (1) inhibition zone   (2) plaque

   (3) halo   (4) colony forming unit

50. Water

   (1) can give up an H^+, becoming OH^-

   (2) can accept an H^+, becoming H_3O^+

   (3) can form hydrogen bonds

   (4) All of the above

51. SARS involves infection of the

   (1) gastrointestinal tract   (2) urinary tract

   (3) respiratory tract   (4) genitourinary tract

77. If there are zero differences in sign test, they may be :
    (1) discarded
    (2) treated half of them as positive
    (3) treated half of them as negative
    (4) all the above

78. If n_1 and n_2 in Mann-Whitney test are large, the variable U is distributed with mean :
    (1) $n_1 n_2$
    (2) $\dfrac{n_1 n_2}{2}$
    (3) $(n_1 - n_2)/2$
    (4) $(n_1 + n_2)/2$

79. A test which maximizes the power of the test for fixed level α is known as :
    (1) Optimum test
    (2) Randomized test
    (3) Bayes test
    (4) Likelihood ratio test

80. Range of statistic-t is :
    (1) -1 to 1
    (2) $-\infty$ to ∞
    (3) 0 to ∞
    (4) 0 to 1

81. Stratified sampling comes under the category of :
    (1) Unrestricted sampling
    (2) Subjective sampling
    (3) Purposive sampling
    (4) Restricted sampling

82. If we have a sample of size n from a population of N units, the finite population correction is :
    (1) $\dfrac{(N-1)}{N}$
    (2) $\dfrac{(N-n)}{N}$
    (3) $\dfrac{(N-n)}{n}$
    (4) $\dfrac{(n-1)}{N}$

83. In which of the following situation(s) cluster sampling is appropriate ?
    (1) When the units are situated far apart
    (2) When sampling frame is not available
    (3) When all the elementary units are not easily identifiable
    (4) All of the above

84. If a random sample of size n is drawn without replacement from a finite population of size n with mean μ and variance σ^2, the covariance between any two members of the sample is :
    (1) $-\dfrac{\sigma^2}{(N-1)}$
    (2) $\dfrac{\sigma^2}{(N-1)}$
    (3) $\dfrac{\sigma^2}{N}$
    (4) $\dfrac{(N-1)}{N}\sigma^2$

P.T.O.

85. If *n* units are selected in a sample from *N* population units, the sampling fraction is :

(1) $\left(\dfrac{N-1}{N}\right)$ (2) $\dfrac{n}{N}$ (3) $\dfrac{N}{n}$ (4) $\dfrac{1}{N}$

86. Under proportional allocation one gets :

(1) an optimum sample   (2) a self-weighting sample

(3) both (1) and (2)   (4) neither (1) nor (2)

87. If the number of population units *N* is an integral multiple of sampling size *n*, the systematic sampling is called :

(1) cluster sampling

(2) stratified sampling

(3) linear systematic sampling

(4) circular systematic sampling

88. Systematic sampling means selection of *n* :

(1) contiguous units   (2) situated at equal distances

(3) largest units   (4) middle units in a sequence

89. Regarding the number of strata, which statement is true ?

(1) not more than ten items should be there in a stratum

(2) lesser the number of strata, better it is

(3) more the number of strata, poor it is

(4) more the number of strata, better it is

90. If the observations recorded on five sampled items are 3, 4, 5, 6, 7 the sample mean square is :

(1) 2.5   (2) 3   (3) 1   (4) 0

91. Which of the following advantage of systematic sampling you approve ?

(1) easy selection of sample

(2) economical

(3) spread of sample over the whole population

(4) all the above

92. In usual notations, the systematic sample mean is more precise than the mean of a random sample taken without replacement if :

(1) $S^2_{wsy} > S^2$ (2) $S^2_{wsy} < S^2$ (3) $S^2_{wsy} = S^2$ (4) $S_{wsy} = S^2$

93. If a systematic sample of size n is drawn from a population of size nk having a linear trend, then the variance of mean of a systematic sample is :

(1) $\frac{(k^2-1)}{12n}$ (2) $\frac{(k^2-1)}{12}$ (3) $\frac{1}{n}\left(1-\frac{1}{k}\right)$ (4) $\frac{1}{k}\left(1-\frac{1}{n}\right)$

94. Completely randomized design is analyzed using :

(1) one-way ANOVA   (2) two-way ANOVA

(3) chi-square test   (4) all the above

95. The technique of analysis of variance was developed by :

(1) C. R. Rao   (2) R. A. Fisher

(3) J. Neyman   (4) G. W. Snedecore

96. In the layout of a randomized block design with seven treatments, each replicated three times, the needed 21 plots will be grouped into :

(1) 7 blocks of 3 plots each   (2) 21 blocks of one plot each

(3) 3 blocks of 7 plots each   (4) 7 blocks of 7 plots each

97. In a completely randomized design, there are 15 plots and 3 treatments. The degrees of freedom associated with error sum of squares is :

(1) 10   (2) 12   (3) 14   (4) 16

98. In a two-way classification with one observation per cell, there are 4 rows and 3 coloumns. The degrees of freedom for the F-test for testing equality of all row means are :

(1) (3, 6)   (2) (4, 6)   (3) (6, 3)   (4) (6, 4)

99. In the degrees of freedom of sum of squares due to error in Latin square design is 6, the number of rows is :

(1) 8   (2) 6   (3) 4   (4) 10

100. The number of degrees of freedom in a 3×3 Latin square design for treatment is :

(1) 9   (2) 6   (3) 4   (4) 2

101. The interaction action effect cannot be studied if the number of observations per cell in two-way classification is :

(1) one   (2) two   (3) four   (4) six

102. In a Latin square design, let m = number of treatments, k = number of replications of treatments, then :

(1) $m \neq k$ (2) $m = k$ (3) $m > k$ (4) $m < k$

103. The experimental design in which only both replication and randomization principles are used, is :

(1) Completely randomized design   (2) Randomized block design

(3) Latin square design   (4) None of these

104. If the number of sample of size 4 in case of systematic sampling is 8, then the population size is :

(1) 8   (2) 10   (3) 16   (4) 32

105. A population consisting of 24 units is divided into two strata such that $N_1 = 15$, $N_2 = 9$, $S_1 = 3$, $S_2 = 5$ in standard notations. If optimum allocation gives $n_2 = 4$, then sample size n will be :

(1) 8   (2) 2   (3) 4   (4) 6

106. Which one of the following is *not* a basic principle of experimental design ?

(1) Randomization   (2) Confounding

(3) Local control   (4) Replicaiton

107. In a 2^3 factorial design, the main effect A can be expressed as :

(1) $\frac{1}{4}[(abc) + (bc) - (ab) - (ac) + (b) + (c) - (a) + (1)]$

(2) $\frac{1}{4}[(abc) + (bc) + (ab) + (ac) - (a) - (b) - (c) - (1)]$

(3) $\frac{1}{4}[(abc) - (bc) + (ab) + (ac) - (b) - (c) + (a) - (1)]$

(4) $\frac{1}{4}[(abc) + (bc) - (ab) + (ac) + (b) + (c) - (a) - (1)]$

(14)

108. Latin square design is :
    (1) complete three-way layout
    (2) one-way layout
    (3) incomplete three-way layout
    (4) None of these

109. Which of the following is a contrast ?
    (1) $3T_1 + T_2 - 3T_3 + T_4$
    (2) $T_1 + 3T_2 - 3T_3 + T_4$
    (3) $T_1 + T_2 + T_3 - T_4$
    (4) $-3T_1 - T_2 + T_3 + 3T_4$

110. If the degree of freedom for error sum of squares in a Latin square design is 30, then the order of the design is :
    (1) 7×7 (2) 6×6 (3) 5×5 (4) 4×4

111. The relation between the operators Δ and E is :
    (1) $E = 1 + \Delta$ (2) $E = 1 - \Delta$ (3) $\Delta E = 1$ (4) $\dfrac{\Delta}{E} = 1$

112. If the third difference of a tabulated function is constant, the function is a polynomial of degree :
    (1) five   (2) four   (3) three   (4) two

113. Let $f(0) = 1$, $f(1) = 2.72$, then the trapezoidal rule gives approximate value of $\int_0^1 f(x)dx$:
    (1) 0.86   (2) 1.50   (3) 1.72   (4) 1.86

114. If $y_1 = 4$, $y_3 = 12$, $y_4 = 19$ and $y_x = 7$ then x will be :
    (1) 1.42   (2) 1.68   (3) 1.86   (4) 1.98

115. Find the number of students who obtained less than 45 marks, from the following data :

Marks	30-40	40-50	50-60	60-70	70-80
No. of students	31	42	51	35	31

    (1) 45   (2) 75   (3) 105   (4) 52

116. Divided difference method can be used when the given independent variate values are :
    (1) at equal intervals
    (2) at unequal intervals
    (3) not well defined
    (4) all the above

117. The value of $\dfrac{Ee^x}{\Delta^2 e^x}$ is equal to :

   (1) e^x (2) e^2 (3) $e/(e-1)^2$ (4) $(e-1)^{-2}$

118. The goemterical significance of trapezoidal rule is that the curve $y = f(x)$ is replaced by the :

   (1) straight line   (2) parabola

   (3) polynomial of degree n (4) None of these

119. In order to apply Weddle's rule for numerical integration, the minimum number of ordinates should be :

   (1) 14   (2) 12   (3) 7   (4) 6

120. If the observed values of x and function u_x are :

x	2	6	8	9
u_x	198	150	102	93

   The interpolating function u_x is :

   (1) $x^3 - 4x^2 + 80x + 102$ (2) $x^3 - 18x^2 + 80x + 294$

   (3) $x^3 - 18x^2 + 80x + 102$ (4) $x^3 - 18x^2 + 80x + 300$

121. Bessel's interpolation formula is most appropriate to estimate for a value in a series which lies :

   (1) at the end   (2) in the beginning

   (3) in the middle of the central interval   (4) outside the series

122. The first divided difference with two arguments x_0, x_1 will be :

   (1) $\dfrac{f(x_1) - f(x_0)}{x_0 - x_1}$ (2) $\dfrac{f(x_1) - f(x_0)}{x_1 - x_0}$ (3) $\dfrac{f(x_0) - f(x_1)}{x_1 - x_0}$ (4) $\dfrac{f(x_1) - f(x_0)}{x_1^2 - x_0^2}$

123. Bessel's and stirling's interpolation formulae yield good estimates if the values of u and v in general lie between :

   (1) -1 and $+1$ (2) -0.5 and 1 (3) -0.5 and 0.5 (4) 0 and 1

   where u and v have their usual meanings.

124. Let X_1, X_2 and X_3 be a random sample of size 3 from a normal population with mean μ and variance σ^2. Then the variance of the estimator $T_1 = (X_1 + X_2 - X_3)$ of μ is :

(1) σ^2 (2) $3\sigma^2$ (3) $2\sigma^2$ (4) $(2/3)\sigma^2$

125. Let X_1, X_2, ..., X_n be a random sample drawn from a normal population $N(\mu,$ 1). Then $T = \dfrac{1}{n}\sum_{i=1}^{n} X_i^2$ is an unbiased estimator of the following :

(1) μ (2) μ^2 (3) $\mu(\mu + 1)$ (4) $\mu^2 + 1$

126. If T is an unbiased estimator for θ, then T^2 is :

(1) an unbiased estimator for θ (2) a biased estimator for θ

(3) an unbiased estimator for θ^2 (4) a biased estimator for θ^2

127. An estimator is said to be sufficient for a parameter, if :

(1) it contains all the information in the sample regarding the parameter

(2) it contains the parameter

(3) it is consistent with all other estimators related to that parameter

(4) none of these

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

(1) V_2/V_1 (2) V_1/V_2 (3) $V_1 + V_2$ (4) $V_1 - V_2$

129. The bias of an estimator can be :

(1) positive   (2) negative   (3) zero   (4) all of these

130. If T_1 is an MVUE of $\gamma(\theta)$ and T_2 is any other unbiased estimator of $\gamma(\theta)$ with efficiency $e < 1$, then MVUE of $\gamma(\theta)$ is :

(1) $T_1 + T_2$

(2) $T_1 - T_2$

(3) $T_1 . T_2$

(4) no unbiased linear combination of T_1 and T_2 can be an MVUE of $\gamma(\theta)$

131. If T_1 and T_2 are MVU estimators for $\gamma(\theta)$, then :

    (1) $T_1 < T_2$

    (2) either $T_1 < T_2$ or $T_1 > T_2$

    (3) $T_1 = T_2$

    (4) none of the above

132. Which one of the following is only a large sample criterion in relation to point estimation ?

    (1) Sufficiency   (2) Unbiasedness   (3) Consistency   (4) Efficiency

133. The maximum likelihood estimators are necessarily :

    (1) unbiased   (2) sufficient   (3) most efficient   (4) unique

134. If the variance of an estimator attains the Crammer-Rao lower bound, the estimator is :

    (1) most efficient   (2) sufficient   (3) consistent   (4) admissible

135. If T_1 and T_2 are two most efficient estimators with the same variance S^2 and the correlation between them is ρ, the variance of $(T_1 + T_2)/2$ is equal to :

    (1) S^2

    (2) ρS^2

    (3) $(1 + \rho)S^2/4$

    (4) $(1 + \rho)S^2/2$

136. Let $X_1, X_2, \ldots\ldots, X_n$ be a random sample from a Bernoulli population $p^x(1 - p)^{n-x}$. A sufficient statistics for p is :

    (1) $\sum_{i=1}^{n} X_i$

    (2) $\prod_{i=1}^{n} X_i$

    (3) $\text{Max}(X_1, X_2, \ldots\ldots, X_n)$

    (4) $\text{Min}(X_1, X_2, \ldots\ldots, X_n)$

137. Age specific fertility curve is :

    (1) highly negatively skewed

    (2) highly positively skewed

    (3) negatively skewed

    (4) positively skewed

138. The extent to which mothers produce female infants who survive to replace them measured by :

    (1) crude birth rate

    (2) total fertility rate

    (3) net reproduction rate

    (4) gross reproduction rate

139. With reference to a life table, which one of the following is *true* ?

(1) $L_x = l_x - d_x$ (2) $p_x = \dfrac{d_x}{l_x}$ (3) $d_x = l_{x+1} - l_x$ (4) $L_x = l_x - \dfrac{1}{2}\,dx$

140. The general fertility rate is determined by :

(1) $\dfrac{B'}{{}^f P_x}$ (2) $\dfrac{B'}{{}^f P_x} \times k$ (3) $\dfrac{B'}{\sum\limits_{\lambda_1}^{\lambda_2} {}^f P_\lambda}$ (4) $\dfrac{B'}{\sum\limits_{\lambda_1}^{\lambda_2} {}^f P_\lambda} \times k$.

where notations have their usual meanings.

141. Crude Birth Rate (CBR) usually lies between :

(1) 10 and 45 per thousand   (2) 8 and 58 per thousand

(3) 10 and 55 per thousand   (4) 12 and 68 per thousand

142. Gross reproduction rate (GRR) ranges from :

(1) 0 to 5   (2) 0 to 1   (3) 0 to 4   (4) 1 to 6

143. Net reproduction rate is more viable than gross reproduction rate because :

(1) it takes into account fertility rate as well as mortality rates

(2) it makes use of life tables

(3) it utilizes survival rate

(4) all the above

144. A life table consists of :

(1) seven columns   (2) eight columns

(3) nine columns   (4) eleven columns

145. The sum of annual age-specific fertility rates over the whole reproductive ages in known as :

(1) general fertility rate   (2) crude birth rate

(3) total fertility rate   (4) net reproduction rate

146. Complete count of the heads of people of a country is known as :

(1) census   (2) vital statistics

(3) demography   (4) none of the above

147. Standardised death rates are particularly useful for :
    (1) comparing the death rates in males and females
    (2) comparing the death rates of two regions
    (3) both (1) and (2)
    (4) neither (1) nor (2)

148. In a 2^3-factorial experiment, the eight treatment combinations in a standard order are :
    (1) 1, a, b, c, ab, ac, bc, abc
    (2) 1, a, c, b, ac, ab, bc, abc
    (3) 1, a, b, ab, c, ac, bc, abc
    (4) 1, b, c, a, ab, ac, bc, abc

149. The death rate of babies under one month is known as :
    (1) foetal death rate
    (2) maternal mortality rate
    (3) neonatal mortality rate
    (4) infant mortality rate

150. The child bearing age in India is :
    (1) 13 - 48 years
    (2) 15 - 49 years
    (3) 20 - 29 years
    (4) 20 - 24 years

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल *नीली/काली बाल-प्वाइंट पेन* से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।

2. परीक्षा भवन में *लिफाफा रहित प्रवेश-पत्र के अतिरिक्त*, लिखा या सादा कोई भी खुला कागज साथ में न लायें।

3. उत्तर-पत्र अलग से दिया गया है। *इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा। केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।*

4. अपना *अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से निर्धारित स्थान पर लिखें।*

5. उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।

6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक संख्या और ओ० एम० आर० पत्र संख्या की प्रविष्टियों में उपरिलेखन को अनुमति नहीं है।

7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।

8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। *प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार बाल-प्वाइंट पेन से गाढ़ा करना है।*

9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।

10. *ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है।* यदि आप किसी प्रश्न का *उत्तर नहीं देना चाहते हैं*, तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें; ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।

11. रफ कार्य के लिये इस पुस्तिका के मुखपृष्ठ के अंदर वाला पृष्ठ तथा अंतिम खाली पृष्ठ का प्रयोग करें।

12. परीक्षा के उपरान्त *केवल ओ० एम० आर० उत्तर-पत्र* ही परीक्षा भवन में जमा करें।

13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।

14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की भागी होगा/होगी।

अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली या काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।

2. परीक्षा भवन में *लिफाफा रहित प्रवेश-पत्र के अतिरिक्त,* लिखा या सादा कोई भी खुला कागज साथ में न लायें।

3. उत्तर-पत्र अलग से दिया गया है। *इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा, केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।*

4. अपना *अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन से* निर्धारित स्थान पर लिखें।

5. उत्तर-पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।

6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न-पुस्तिका पर अनुक्रमांक सं० और ओ० एम० आर० पत्र सं० की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।

7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।

8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। *प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर-पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।*

9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।

10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का *उत्तर नहीं देना चाहते हैं,* तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।

11. रफ़ कार्य के लिये प्रश्न-पुस्तिका के मुखपृष्ठ के अन्दर वाले पृष्ठ तथा अंतिम पृष्ठ का प्रयोग करें।

12. परीक्षा के उपरान्त केवल *ओ०एम०आर०* उत्तर-पत्र परीक्षा भवन में जमा कर दें।

13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।

14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।