Health Stat

11P/211/31 060

Set No. – 1 Question Booklet No. .....

(To be filled up by the candidate by ***blue/black ball-point pen***)

Roll No. | | | | | | | | |

Roll No.

(Write the digits in words) .....

Serial No. of Answer Sheet .....

.....

Day and Date ..... (Signature of Invigilator)

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 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 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 : 30

No. of Questions : 150

Time : $2\frac{1}{2}$ Hours] *[Full Marks : 450*

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

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

1. An ordinal variable is one for which :

(1) The data are discrete and can take one of many values

(2) The data are continuous and follow an ordered sequence

(3) The data are categorical

(4) There can only be two categories of response

2. Which of the following variables are measured on a nominal scale ?

(1) Height in cm

(2) Ethnic group

(3) Social class (I/II/III-N/III-M/IV/V)

(4) Age categorized as young, middle-aged or old

3. The data given as 6, 9, 12, 19, 81, 84, 95 will be called as :

(1) a continuous series (2) a discrete series

(3) an individual series (4) time series

4. The series :

Marks	:	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80
Number of students	:	5	14	24	12	9	2

is of the type :

(1) Discrete series (2) Individual series

(3) Continuous series (4) None of these

5. Frequency of a variable is always :

(1) an integer (2) a fraction (3) in percentage (4) none of these

6. Whether classification is done first or tabulation ?

(1) Both are done simultaneously (2) Classification precedes tabulation

(3) Classification follows tabulation (4) None of these

7. Which of the followings is a one-dimensional diagram ?

(1) Bar diagram (2) Pie-chart (3) Cylinder (4) A graph

8. Ogives for more than type and less than type distributions intersect at :

(1) Mean (2) Median (3) Mode (4) Origin

9. A bar chart :

(1) used to display categorical data

(2) can also be called a histogram

(3) should be drawn without gaps between the bars

(4) can only be used to display data which have a symmetrical distribution

10. The most appropriate diagram to represent the Five Year Plan outlay of a country in different economic sectors is the following :

(1) Pie diagram (2) Histogram

(3) Line graph (4) Frequency curve

11. In constructing a histogram with unequal class interval, the heights of the rectangles are chosen such that :

(1) They are proportional to the respective width of the class intervals

(2) The resulting histogram looks bell shaped

(3) They are equal irrespective of the width of the class interval

(4) The areas of the resulting rectangles are proportional to the frequencies of respective class

12. The median of the weight at birth of babies 2500, 2100, 2630, 2550, 2700, 2650, 2300, 3100, 3000, 3050 gm is :

(1) 2650 (2) 2600 (3) 2640 (4) 2630

13. In statistics the most commonly used frequency curve is :

(1) inverted J-shaped (2) U-shaped

(3) bell-shaped (4) mixed

14. An aeroplane covers the four sides of a square at speeds of 1000, 2000, 3000 and 4000 km/hr. respectively. The average speed of the plane in its flight around the square will be :

(1) 2500 km/hr. (2) 1920 km/hr. (3) 1290 km/hr. (4) 2000 km/hr.

15. The mean marks of 100 students were found to be 40. Later on it was discovered that a score of 53 was misread as 83. The correct mean will be :

(1) 43.5 (2) 37.9 (3) 39.7 (4) 42.5

16. Variance of n observations is found to be σ^2. Each observation is increased by a constant k where $k > 0$. If s^2 denotes the variance of new set of observations, then :

(1) $\sigma^2 = s^2$ (2) $(\sigma + k)^2 = s^2$ (3) $\sigma^2 = (s + k)^2$ (4) $\sigma^2 = s^2 + k^2$

17. The standard deviation of the following :

Class :	0 – 10	10 – 20	20 – 30	30 – 40
Frequency :	1	3	4	2

is :

(1) 7.6 (2) 81 (3) 3.24 (4) 9

18. The positional measure of central tendency is :

(1) Median (2) Arithmetic mean

(3) Harmonic mean (4) Geometric mean

19. If the coefficient of kurtosis γ_2 of a distribution is zero, the frequency curve is :

(1) lepto kurtic (2) platy kurtic (3) meso kurtic (4) none of these

20. The coefficient of skewness of a series A is 0.15 and that of series B is 0.062. Which of the two series is less skew ?

(1) series A (2) series B (3) no decision (4) none of these

21. Height and weight of children have the correlation :

(1) Zero (2) One (3) Negative (4) Positive

22. If $\beta_{yx} < 1$, then β_{xy} is :

(1) less than 1 (2) greater than 1 (3) equal to 1 (4) equal to 0

where β_{yx} and β_{xy} stand for regression coefficients of y on x and x on y respectively.

23. If the variables x and y are independent, the value of regression coefficient y on x (i.e. β_{yx}) is equal to :

(1) 0 (2) 1

(3) ∞ (4) any positive value

24. Two series x and y with 50 items each have standard deviation 4.5 and 3.5 respectively. The sum of product of deviations of x and y series from their respective arithmetic mean is 420. Then the coefficient of correlation between x and y will be :

(1) 0.85 (2) 0.533 (3) 0.253 (4) 0.485

25. Given the two lines of regression as $3x + 4y + 8 = 0$ and $4x - 3y = 1$, the means of x and y are :

(1) $\bar{x} = 4,\ \bar{y} = 5$ (2) $\bar{x} = 3,\ \bar{y} = 4$ (3) $\bar{x} = \frac{4}{3},\ \bar{y} = \frac{5}{4}$ (4) $\bar{x} = \frac{3}{4},\ \bar{y} = \frac{4}{5}$

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. If $R_{1.32} = 0$, then all total and partial correlation coefficients involving x_1 are :

(1) 1 (2) $\frac{1}{2}$ (3) -1 (4) 0

28. 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

29. If the regression coefficient of x on y, the coefficient of correlation between x and y, and variance of x are -2, $-\sqrt{\frac{3}{2}}$ and $\frac{16}{3}$ respectively. The variance of y is :

(1) $2\sqrt{2}$ (2) 2 (3) $\frac{1}{\sqrt{2}}$ (4) $\sqrt{2}$

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

31. For two events A and B, let $P(A)=\frac{3}{8}$, $P(B)=\frac{2}{3}$ and $P(A\cap B)=\frac{1}{4}$, then A and B are :

(1) mutually exclusive but not independent

(2) independent but not mutually exclusive

(3) mutually exclusive and independent

(4) neither mutually exclusive nor independent

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

(1) $\frac{5}{36}$ (2) $\frac{7}{36}$ (3) 1 (4) $\frac{11}{36}$

33. The probability of an occurrence can be :

(1) -1 to 1 (2) 0 to 1 (3) 0 to ∞ (4) $-\infty$ to ∞

34. 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) 1/4 (2) 2/3 (3) 1/8 (4) 1/12

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

(1) 0 (2) $\frac{1}{2}$ (3) 2 (4) 1

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

(1) Poisson (2) Binomial (3) Uniform (4) Normal

37. If the mean, median and mode coincide then the distribution is :

(1) Geometric (2) Symmetrical (3) Rectangular (4) Poisson

38. 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) $\frac{3}{5}$ (2) 0.5 (3) 0.8 (4) $\frac{3}{4}$

39. If a random variable x has a Poisson distribution such that $p(x = 1) = p(x = 2)$ then the variance of the distribution is :

(1) 3 (2) 1 (3) 4 (4) 2

40. If two independent random variables x and y are distributed as $B\left(4, \frac{1}{3}\right)$ and $B\left(5, \frac{1}{3}\right)$, then the distribution of $x + y$ is :

(1) $B\left(9, \frac{1}{3}\right)$ (2) $B\left(5, \frac{2}{3}\right)$ (3) $B\left(4, \frac{2}{3}\right)$ (4) $B\left(20, \frac{1}{9}\right)$

41. For a binomial distribution $B(n, p)$, then the mean is 4 and variance 3, then n is :

(1) 20 (2) 16 (3) 18 (4) 10

42. Which distribution is the weekly number of car accidents on a stretch of road likely to follow ?

(1) Geometric distribution (2) Normal distribution

(3) Poisson distribution (4) Binomial distribution

43. The mode of the geometric distribution $\left(\frac{1}{2}\right)^x$ for $x = 1, 2, \ldots\ldots$ is :

(1) 0 (2) $\frac{1}{2}$ (3) $\frac{2}{3}$ (4) 1

44. If $x \sim N(\mu, \sigma^2)$, the maximum probability at the point of inflexion of normal distribution :

(1) $\frac{1}{\sqrt{2\pi}} e^{\frac{1}{2}}$ (2) $\frac{1}{\sqrt{2\pi}} e^{\frac{-1}{2}}$ (3) $\frac{1}{\sigma\sqrt{2\pi}} e^{\frac{-1}{2}}$ (4) $\frac{1}{\sqrt{2\pi}}$

45. The probability mass function for the negative binomial distribution with parameters r and p is :

(1) $\binom{-r}{x} (-1)^x \; p^r \; q^x$ (2) $\binom{x+r-1}{r-1} p^r \; q^x$

(3) $\binom{-r}{x} p^r \; (-q)^x$ (4) all of the above

46. A random variable x takes values 2, 1, 0 with probabilities α, 2α and $(1 - 3\alpha)$. If $E(x) = 1$, then the value of α is :

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

47. For an exponential distribution with probability density function $f(x) = (1/2)\, e^{-x/2}$; $x \geq 0$; its mean and variance are :

(1) $\left(\frac{1}{2}, 2\right)$ (2) (2, 4) (3) $\left(2, \frac{1}{4}\right)$ (4) $\left(\frac{1}{2}, \frac{1}{4}\right)$

48. A random variable has uniform distribution over the interval [–1, 3]. This distribution has variance equal to :

(1) $\frac{8}{5}$ (2) $\frac{4}{3}$ (3) $\frac{13}{4}$ (4) $\frac{9}{2}$

49. Let x_1 and x_2 be two independent gamma random variables. Then $\frac{x_1}{x_1+x_2}$ has :

(1) gamma distribution (2) beta distribution

(3) normal distribution (4) F-distribution

50. If the joint probability density function of x and y, is $f(x, y) = 3 - x - y$ for $0 \le x \le 1,\ 0 \le y \le 1$, then the marginal distribution of y is :

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

51. If x and y are two random variables having joint probability density function :

$$f(x,y)=\frac{1}{8}(6-x-y)\ ;\ 0<x<2,\ 2<y<4$$

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

Then $p(x<1 \mid y<3)$ is :

(1) $\frac{3}{8}$ (2) $\frac{5}{24}$ (3) $\frac{9}{40}$ (4) $\frac{3}{5}$

52. For the normal distribution, the quartile deviation, the mean deviation and standard deviation are approximately :

(1) $\frac{1}{3} : \frac{1}{5} : 1$ (2) $\frac{2}{3} : \frac{3}{5} : \frac{1}{2}$ (3) 10 : 12 : 15 (4) 2 : 3 : 3

53. Given the joint probability mass function of x and y be $f(x,y)=\frac{x+y}{21}$; $x=1,\ 2,\ 3;\ y=1,\ 2$; the $p(x=3)$ is equal to :

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

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

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

$= 0,$ otherwise

The $p\left(0 < x < \frac{1}{2}\ ;\ \frac{1}{2} \le y \le 1\right)$ is equal to :

(1) $\frac{3}{16}$ (2) $\frac{3}{8}$ (3) $\frac{5}{16}$ (4) $\frac{1}{4}$

55. The probability of Type I error is the chance of :

(1) rejecting the null hypothesis when it is true

(2) not rejecting the null hypothesis when it is true

(3) rejecting the null hypothesis when it is false

(4) accepting the null hypothesis when it is false

56. Assuming all other relevant factors remain constant, the power of a test :

(1) decreases as the size of the sample increases

(2) increases as the variability of the observations decreases

(3) increases as the significance level decreases

(4) is the chance of rejecting the null hypothesis when it is true

57. To test the randomness of a sample, the appropriate test is :

(1) Median test (2) Sign test (3) Run test (4) None of these

58. Most of the non-parametric methods utilise measurements on :

(1) interval scale (2) ratio scale (3) ordinal scale (4) nominal scale

59. Ordinary sign test utilises :

(1) Poisson distribution (2) Binomial distribution

(3) Geometric distribution (4) Negative Binomial distribution

60. If there are 10 symbols of two types, equal in number, the minimum possible number of runs is :

(1) 8 (2) 9 (3) 10 (4) none of these

61. A test based on a test statistic is classified as :

(1) randomised test (2) non-randomised test

(3) sequential test (4) Bayes test

62. The standard error of an estimator t of the parameter θ is :

(1) $E(t)-\theta$ (2) $V_{ar}(t)$ (3) $\sqrt{V_{ar}(t)}$ (4) $\sqrt{V_{ar}(t)}\,/\,\{E(t)\}$

63. If E(statistic) = Parameter, then statistic is said to be :

(1) positively biased estimate (2) negatively biased estimate

(3) an unbiased estimate (4) none of these

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

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

65. In usual notations, the test statistic for testing the significance of population correlation coefficient $\rho = 0$, is :

(1) $t=\frac{r\sqrt{(n-2)}}{\sqrt{(1-r^2)}}$ (2) $t=\frac{r\sqrt{(1-r^2)}}{\sqrt{(n-2)}}$ (3) $t=\frac{r\sqrt{(n-2)}}{(1-r^2)}$ (4) $t=\frac{r\,(1-r)}{\sqrt{(n-2)}}$

66. Two different companies manufacture light bulbs A and B respectively. Each company claims that its bulbs are superior to that of the other. To test the superiority of the bulbs A or B, the null hypothesis would be :

(1) there is a difference between the two bulbs

(2) there is no difference between the lives of two bulbs

(3) there is no difference between the two bulbs

(4) there is a difference between the lives of two bulbs

67. Let $(x_1, y_1), (x_2, y_2), \ldots\ldots, (x_n, y_n)$ be a random sample from a bivariate normal population $BN(\mu_1, \mu_2, \sigma_1^2, \sigma_2^2, \rho)$, Fisher z-transformation used is :

(1) $z = \frac{1}{2}\log_{10}\frac{1+r}{1-r}$ (2) $z = \frac{1}{2}\log_e\frac{1+r}{1-r}$

(3) $z = \frac{1}{2}\log_e\frac{1-r}{1+r}$ (4) $z = \frac{1}{2}\log_{10}\frac{1-r}{1+r}$

68. Formula for χ^2 (chi-square) for testing a null hypothesis in a multinomial distribution with usual notations is :

(1) $\chi^2 = \sum_{i=1}^{k}\frac{(O_i - E_i)^2}{E_i}$ (2) $\chi^2 = \sum_{i=1}^{k}\left(\frac{O_i - E_i}{E_i}\right)^2$

(3) $\chi^2 = \sum_{i=1}^{k}\frac{(O_i - E_i)^2}{O_i}$ (4) $\chi^2 = \sum_{i=1}^{k}\left(\frac{O_i - E_i}{O_i}\right)^2$

69. The two sample t-test :

(1) may also be called the paired t-test

(2) is an alternative test to the wilcoxon signed ranks test

(3) is appropriate when our aim is to compare the medians in two independent groups of observations

(4) assumes that the observations in each of the two comparative groups have the same variance

70. We use the Chi-square test to compare two proportions in a 2×2 contingency table provided that :

(1) there is no association between the factors that define the rows and columns of the table

(2) the observed frequency in each cell of the table is greater than or equal to 5

(3) the rows (and columns) of the table are mutually exclusive

(4) the observed and expected frequencies in each cell of the table are equal

71. In a test, a difference is found significant in a two-tailed test, what can you say about the result in a one tailed test at the same level of significance :

(1) It is automatically significant in a one tailed test

(2) It is definitely not significant in a one tailed test

(3) It may or may not be significant

(4) Significance depends on the level chosen

72. Let x have normal distribution $N(\mu, 9)$. If on the basis of a random sample of size 16, sample mean comes out to be 20, then 95% confidence interval for μ is :

(1) (20 ± 1.23) (2) (20 ± 1.47) (3) (20 ± 3.69) (4) (20 ± 0.92)

73. The hypothesis that the normal population variance has a definite value, can be tested by :

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

74. Samples of size n are drawn from a population of size N according to simple random sampling without replacement (SRSWOR). Then the number of possible samples be :

(1) n^N (2) N^n (3) $\binom{N}{n}$ (4) ${}^{N}P_{n}$

75. In a simple random sampling with replacement (SRSWR), the probability of a particular unit being selected at the rth draw is :

(1) $\frac{1}{\binom{N}{r}}$ (2) $\frac{1}{N}$ (3) $\frac{r}{N}$ (4) $\frac{1}{(N-r)}$

76. If the variances of sample mean in SRSWOR and SRSWR are respectively V_{WOR} and V_{WR}, and $e = (V_{WOR} / V_{WR})$, then e is :

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

77. Which one of the following procedures is not based on the principle of probability ?

(1) Systematic sampling (2) Simple random sampling

(3) Stratified sampling (4) Quota sampling

78. In stratified random sampling, the variance is minimum with :

(1) optimum allocation (2) proportional allocation

(3) equal allocation (4) allocation in middle of stratum

79. A population of 800 is divided in 3 strata, their sizes and standard deviations (s. d.) are :

	Strata		
	I	*II*	*III*
size	200	300	300
s. d.	6	8	12

A stratified sample of size 120 is to be drawn from the population. The size of the sample from second stratum, by Neyman's allocation is :

(1) 45 (2) 35 (3) 50 (4) 40

80. Non-sampling error arises in :

(1) sampling (2) complete enumeration

(3) estimator (4) (1) and (2) both

81. Advantages of sampling over complete enumeration is :

(1) only less time (2) only less man power

(3) only reduced cost (4) all of these

82. If the size of a random sample were increased, we would expect :

(1) The mean to decrease

(2) The standard error of the mean to decrease

(3) The standard deviation to decrease

(4) The sample variance to increase

83. 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 ?

(1) $s_w^2 = s_b^2$ (2) $s_w^2 \geq s_b^2$ (3) $s_w^2 \leq s_b^2$ (4) none of these

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

(1) linear systematic sampling (2) circular systematic sampling

(3) random systematic sampling (4) stratified systematic sampling

85. A population is divided into three strata consisting of 10, 15 and 35 units respectively. If a sample of size 12 is selected with proportional allocation, the number of units drawn from the stratum with 10 units is :

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

86. If there is a linear trend in the population, then out of the following sampling methods the one which gives the most efficient estimator of the population mean is :

(1) stratified random sampling (2) simple random sampling

(3) cluster sampling (4) systematic sampling

87. A systematic sample is more precise than a simple random sample without replacement (SRSWOR) if the mean square within the systematic sample is :

(1) equal to the population mean square

(2) larger than the population mean square

(3) smaller than the population mean square

(4) None of these

88. The variance of stratified random sample mean $\bar{y}_{st}$ under proportional allocation is :

(1) $\left(\frac{1}{n}-\frac{1}{N}\right)S^2$

(2) $\left[\frac{1}{n}\left(\sum_{i=1}^{k} W_i S_i\right)^2-\frac{1}{N}\sum_{i=1}^{k} W_i S_i^2\right]$

(3) $\left(\frac{1}{n}-\frac{1}{N}\right)\sum_{i=1}^{k} W_i S_i^2$

(4) $\left(\frac{1}{n}-\frac{1}{N}\right)\sum_{i=1}^{k} W_i^2 S_i^2$

Where notations have their usual meanings.

89. The relative efficiency of the estimate of the population mean in systematic sampling over SRSWOR is :

(1) $\frac{n}{(N-1)[1+(n-1)\rho]}$

(2) $\frac{(N-1)}{(N-n)[1+(n-1)\rho]}$

(3) $\frac{k(n-1)}{(nk-1)[1+(n-1)\rho]}$

(4) $\frac{n(k-1)}{(N-1)[1+(n-1)\rho]}$

Where k is the sampling interval, ρ is the intraclass correlation coefficient between the units of the same systematic sample and other notations have their usual meanings.

90. In a Latin square design, the number of replicates and the number of treatments :

(1) must be equal

(2) former is smaller than the latter

(3) former is greater than the latter

(4) should not be equal

91. If the degrees of freedom of sum of squares due error in a Latin square design is 6, the number of rows is :

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

92. In a two-way classification with one observation per cell, there are 4 rows and 3 columns. 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)

93. 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

94. In the layout of randomized block design with seven treatments, each replicated five times, the needed 35 units will be grouped into :

(1) 35 blocks of one plot each (2) 7 blocks of 5 plots

(3) 5 blocks of 7 plots (4) None of these

95. One step of sample survey is not :

(1) To form questionnair (2) To collect data

(3) To prepare report (4) To generate electricity

96. The method of confounding is a device to reduce the size of :

(1) experiments (2) replications (3) blocks (4) all of the above

97. A systematic sample does not yield good result if :

(1) Variation in units is periodic

(2) Units at regular interval are correlated

(3) Both (1) and (2)

(4) Neither (1) nor (2)

98. Local control is used to :

(1) increase the number of plots (2) reduce the experimental error

(3) reduce the degrees of freedom (4) reduce the number of replications

99. In a 2^3-factorial experiment the interaction effect of AB is expressed as :

(1) $AB = \frac{1}{4}(a-1)(b-1)(c+1)$ (2) $AB = \frac{1}{4}(a-1)(b-1)(c-1)$

(3) $AB = \frac{1}{4}(a-1)(b+1)(c-1)$ (4) $AB = \frac{1}{4}(a+1)(b+1)(c-1)$

100. 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) $-3T_1 - T_2 + T_3 + 3T_4$

101. Two contrasts of k-treatment means $t_i (i = 1, 2, ..., k)$, viz.

$\sum_{i=1}^{k} c_i\, t_i, \quad \sum_{i=1}^{k} c_i = 0$

and $\sum_{i=1}^{k} d_i\, t_i, \quad \sum_{i=1}^{k} d_i = 0$

are said to be orthogonal if :

(1) $\sum_{i=1}^{k} c_i\, d_i > 0$ (2) $\sum_{i=1}^{k} c_i\, d_i < 0$ (3) $\sum_{i=1}^{k} c_i\, d_i = 0$ (4) None of these

102. If k effects are confounded in a 2^n factorial to have 2^k blocks of size 2^{n-k} units, the number of automatically confounded effect is :

(1) $2^k - k$ (2) $k(k-1) - 1$ (3) $2^k - k - 1$ (4) 2^{k-1}

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

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

104. Gross reproduction rate (GRR) is determined by :

(1) $\frac{\text{Number of female birhts}}{\text{Total number of births}} \times 1000$ (2) $\frac{\text{Total births}}{\text{Total population}} \times 1000$

(3) $\frac{\text{Total births}}{\text{Total female population}} \times 1000$ (4) $\frac{\text{Number of female birhts}}{\text{Total number of births}} \times \text{TFR}$

105. GRR ranges from :

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

106. If net reproduction rate (NRR) is greater than unity then the population has a tendency to :

(1) decrease (2) increase

(3) remain more or less constant (4) none of these

107. Crude Birth Rate (C.B.R.) usually lies between :

(1) 10 and 45 per thousand (2) 8 and 55 per thousand

(3) 10 and 55 per thousand (4) 11 and 65 per thousand

108. The relation between NRR and GRR is :

(1) NRR can never exceed GRR (2) NRR and GRR are usually equal

(3) NRR is generally greater than GRR (4) None of these

109. A life table constructed for an age interval of 5 to 10 years is specifically known as :

(1) grouped life table
(2) interval life-table
(3) abridged life table
(4) none of the above

110. The total fertility rate is approximately determined by the formula :

(1) $\sum_{x} n\,(n\ ^{i}x)$ (2) $\sum_{n=0}^{\infty} n\,(n\ ^{i}x)$ (3) $\sum_{i=0}^{\infty} n\ ^{i}x$ (4) n

111. With reference to an abridged life table, which the following is true ?

(1) $n\,^{q}x = 1 + \frac{l_{x+n}}{l_x}$
(2) $n\,^{q}x = \frac{1}{2}(l_x + l_{x+n})$
(3) $n\,^{q}x = 1 - \frac{l_{x+n}}{l_x}$
(4) $n\,^{q}x = n\,^{d}x + l_{x+n}$

112. The total age specific fertility rate taken at 5 years intervals for a group of child bearing females is 446, then the total fertility rate per thousand is :

(1) 446 (2) 892 (3) 2676 (4) 2230

113. The ratio of the number of children of age less than five years to the total number of women 15 – 49 year age is called :

(1) replacement index
(2) gross reproduction rate
(3) vital index
(4) net reproduction rate

114. The fertility of a women in India is maximum in the age group :

(1) 15 – 20 (2) 20 – 24 (3) 25 – 29 (4) 15 – 29

115. The age specific mortality of 1000 new-born babies in first three days of life were as under :

Days	1	2	3
Mortality	0.005	0.002	0.001

Then the babies remaining alive after three days :

(1) 997 (2) 992 (3) 999 (4) 995

116. The vital event is :

(1) getting service

(2) getting good marks in an examination

(3) getting a son

(4) birth and death

117. The census data is :

(1) primary data (2) secondary data

(3) continuous data (4) discrete data

118. The census of India is organized by :

(1) Registrar General of India

(2) Planning Commission

(3) Central Statistical Organization (CSO)

(4) National Sample Survey Organization

119. A life-table based on the experience of actual cohort is called :

(1) generation life-table (2) fluent life-table

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

120. Fecundity provides :

(1) a lower bound for fertility (2) an upper bound for fertility

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

121. Reproduction can be measured by :

(1) age specific fertility rate

(2) total fertility rate

(3) standardized rate

(4) general fertility rate

122. The age standardized death rate for city A by direct method of standardization is :

(1) $\sum_x m_x^s \; p_x^a / \sum_x p_x^a$

(2) $\sum_x m_x^s \; p_x^s / \sum_x p_x^a$

(3) $\sum_x m_x^a \; p_x^s / \sum_x p_x^s$

(4) $\sum_x m_x^a \; p_x^a / \sum_x p_x^a$

where notations have their usual meanings.

123. The odds ratio :

(1) is an estimate of the relative risk when the incidence of the disease is rare

(2) is calculate in a cohort study because the relative risk cannot be estimated directly

(3) is equal to zero when the odds of being a case in the exposed and unexposed groups are equal

(4) is the ratio of the probability of being a case in the exposed group to the probability of not being a case in the exposed group

124. The relation between the central mortality rate 'm_x' and force of mortality 'μ_x' is :

(1) $m_x = \frac{1}{2} \mu_{x+1}$

(2) $m_x = \mu_{x+\frac{1}{2}}$

(3) $m_x = \frac{2 \mu_x \mu_{x+1}}{\mu_x + \mu_{x+1}}$

(4) $m_x = \frac{1}{2} (\mu_x + \mu_{x+1})$

125. Having known the population of the two consecutive censuses, the formula for population estimate $\hat{P}_t$ in the intercensal year t with usual notations is :

(1) $\hat{P}_t = P_0 + \frac{N}{n}(P_1 - P_0)$ (2) $\hat{P}_t = P_1 + \frac{N}{n}(P_1 - P_0)$

(3) $\hat{P}_t = P_0 + \frac{N}{n}(P_1 - P_0)$ (4) $\hat{P}_t = P_0 + \frac{N}{n}(P_0 - P_1)$

126. Let U_t follow Logistic law. Then the reciprocal of U_t will follow :

(1) Gompertz law (2) Modified exponential law

(3) Poisson law (4) Negative Binomial law

127. The relation between the operators Δ and E is :

(1) $E = 1 + \Delta$ (2) $E = 1 - \Delta$ (3) $\Delta E = 1$ (4) $\frac{\Delta}{E} = 1$

128. If the third difference of a tabulated function is constant, the function is a polynomial of degree :

(1) three (2) two (3) five (4) four

129. The Newton – Gregory backward interpolation formula is generally used to interpolate the values :

(1) at the end of a set of a table

(2) near the beginning of a set of table values

(3) in the middle of a set of a table values

(4) anywhere in the set of table values

130. The polynomial of first degree :

(1) is not a polynomial (2) is a straight line

(3) can be any shape (4) None of these

131. For the given data :

x	:	–2	0	3	5	1
$f(x)$	:	4	0	9	25	1

$f(x)$ is the degree of polynomial :

(1) three degrees (2) two degrees (3) five degrees (4) four degrees

132. Divided differences are useful when :

(1) arguments are equally spaced

(2) arguments are not equally spaced

(3) arguments advance with unit interval

(4) all of the above

133. Newton's method of divided differences is preferred when :

(1) the arguments are not equally spaced

(2) when the interpolating value of the argument lies in the upper half of the series

(3) both (1) and (2)

(4) none of (1) and (2)

134. Simpson's 1/3rd and Simpson's 3/8th rules are used for :

(1) interpolation (2) numerical differentiation

(3) numerical integration (4) inverse interpolation

135. 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.

136. Trapezoidal rule gives the exact value for integral only if the function is :

(1) a polynomial of degree four (2) cubic

(3) quadratic (4) linear

137. Simpson's rule requires :

(1) an odd number of points (2) even number of points

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

138. If (n + 1) pairs of arguments and entries are given, Lagrange's formula is :

(1) a polynomial of degree n in y

(2) a polynomial of degree n in x

(3) a polynomial in x in which each term has degree n

(4) a polynomial with highest degree 1

139. Mean square error (MSE) of an estimator t of the parameter θ is :

(1) $E[t-E(t)]^2$ (2) $(E(t)-\theta)^2$

(3) $[E\{t-E(t)\}^2+(E(t)-\theta)^2]$ (4) $[E\{t-E(t)\}^2-(E(t)-\theta)^2]$

140. If 't' is an unbiased and consistent estimator of θ, then t^2 as an estimate of θ^2 is :

(1) unbiased and consistent (2) biased and consistent

(3) unbiased and inconsistent (4) biased and inconsistent

141. For the probability density function $f(x,\theta)=\frac{1}{\theta}$, $0 < x < \theta$ an unbiased estimator of θ is :

(1) $\overline{X}$ (2) $\frac{1}{\overline{X}}$ (3) $2\overline{X}$ (4) $\frac{2}{\overline{X}}$

142. Suppose that T_1 and T_2 are two unbiased estimators of θ. If T_1 is the minimum variance unbiased estimator and e is the efficiency of T_2, the correlation coefficient between T_1 and T_2 is :

(1) $\frac{1}{\sqrt{e}}$ (2) e (3) $\frac{1}{e}$ (4) $\sqrt{e}$

143. Out of the following, the one which is not a method of point estimation is :

(1) Method of maximum likelihood (2) Method of least squares

(3) Method of moments (4) Method of Invariance

144. If $X_1, X_2, ..., X_n$ is a random sample from the population having the probability den function,

$$f(x;\theta)=\frac{1}{\sqrt{2\pi\theta}}\exp\left(-\frac{x^2}{2\theta}\right)$$

then the maximum likelihood estimator for θ is :

(1) $\sqrt{\frac{\Sigma x_i^2}{n}}$ (2) $\Sigma x_i^2/n$ (3) $\sqrt{\frac{\Sigma x_i^2}{n}}$ (4) $\frac{\Sigma x_i^2}{\sqrt{n}}$

145. A minimum variance unbiased estimator T_n is said to be unique if for any other estimator T_n^* :

(1) $Var(T_n)=Var(T_n^*)$ (2) $Var(T_n)\leq Var(T_n^*)$

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

146. If λ is the likelihood ratio test statistic, then the asymptotic distribution of which one of the following statistic is χ^2-distribution ?

(1) $\log_e \lambda$ (2) $\log_e \frac{1}{\lambda}$ (3) $\log_e \lambda^2$ (4) $\log_e \frac{1}{\lambda^2}$

147. Under certain assumptions, likelihood ratio test is :

(1) Efficient (2) Unbiased (3) Consistent (4) Sufficient

148. Let $x_1, x_2, ..., x_n$ denote a random sample of size n from a uniform population with probability density function :

$$f(x, \theta) = 1; \quad \theta - \frac{1}{2} \le x \le \theta + \frac{1}{2}, \quad -\infty < \theta < \infty$$

The maximum likelihood estimator for θ is the statistic $t = t(x_1, x_2, ..., x_n)$ such that :

(1) $x_{(n)} < t(x_1, x_2, ..., x_n) < x_{(1)} + \frac{1}{2}$

(2) $x_{(n)} - \frac{1}{2} < t(x_1, x_2, ..., x_n) < x_{(1)} + \frac{1}{2}$

(3) $x_{(n)} - \frac{1}{2} < t(x_1, x_2, ..., x_n) < x_{(1)}$

(4) $x_{(n)} + \frac{1}{2} < t(x_1, x_2, ..., x_n) < x_{(1)} + 1$

Where $x_{(1)}, x_{(2)}, ..., x_{(n)}$ is the ordered sample (i.e. $x_{(1)} < x_{(2)} < ..... < x_{(n)}$)

149. In the case of Pearson's Type III distribution

$$f(x;\alpha,\beta)=\frac{\beta^{\alpha}}{\Gamma(\alpha)}\ x^{\alpha-1}\ e^{-\beta x},\ 0\le x<\infty$$

The estimates of α and β obtained by the method of moments are :

(1) $\hat{\alpha}=\dfrac{m'^{2}_{1}}{(m'_2-m'^{2}_{1})}$, $\hat{\beta}=\dfrac{m'_1}{(m'_2-m'^{2}_{1})}$

(2) $\hat{\alpha}=\dfrac{m'^{2}_{1}}{(m'_2+m'^{2}_{1})}$, $\hat{\beta}=\dfrac{m'_1}{(m'_2+m'^{2}_{1})}$

(3) $\hat{\alpha}=\dfrac{m'_1}{(m'_2-m'^{2}_{1})}$, $\hat{\beta}=(m'_2-m'^{2}_{1})^{-1}$

(4) $\hat{\alpha}=(m'_2-m'_1)^{-1}$, $\hat{\beta}=(m'_2+m'^{2}_{1})^{-1}$

Where m'_1 and m'_2 are the sample moments.

150. A random sample of three observations is taken from a normal population. Which one of the following unbiased estimators of mean has least variance ?

(1) x_3 (2) $\dfrac{x_2+x_3}{2}$ (3) $\dfrac{x_1+x_2+3x_3}{5}$ (4) $\dfrac{x_1+x_2+x_3}{3}$

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 ले कि प्रश्नपत्र में सभी पृष्ठ मौजूद है 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 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. 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।