M.Sc. Hlth Stat

190

12P/211/30

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. The data given as 3, 5, 7, 9, 11, 13 will be called as :

(1) continuous series (2) discrete series

(3) an individual series (4) time series

2. Frequency of a variable is always :

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

3. Which of the following is one-dimensional diagram ?

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

4. Which of the following is ***not*** a two-dimensional diagram ?

(1) Square diagram (2) Multiple bar diagram

(3) Pie-chart (4) Rectangular diagram

5. In case of frequency distribution with classes of unequal widths, the heights of bars of a histogram are proportional to :

(1) class frequency (2) class intervals

(3) frequency in percentage (4) frequency densities

6. Pie-chart represents the components of a factor by :

(1) percentages (2) angles (3) sectors (4) circles

7. Histogram is suitable for the data presented as :

(1) continuous grouped frequency distribution

(2) discrete grouped frequency distribution

(3) individual series

(4) all of the above

8. The most appropriate 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

9. Ogives for more than type and less than type distribution intersect at :

(1) mean (2) mode (3) origin (4) median

10. The median of the weight at birth of babies 2000, 2500, 2100, 2550, 2700, 2650, 2300, 3000, 3050, 2630 gm is :

(1) 2590 (2) 2700 (3) 2650 (4) 2675

11. The mean of ten, two digit numbers is 20, if a number of value 25 is replaced by 35, then the mean is :

(1) 19 (2) 21 (3) 25 (4) 20

12. The arithmetic mean of two numbers is 6.5 and their geometric mean is 6. The two numbers are :

(1) 9, 6 (2) 9, 5 (3) 7, 6 (4) 4, 9

13. If SD of Hb levels of two groups of children are equal, then mean of both the groups :

(1) may not be necessarily equal (2) will also be necessarily equal

(3) will be equal to zero (4) will not be equal

14. Hb level of 25 sick children is given as 8 mg%ge and standard deviation (SD) as 2 mg%ge. Then the coefficient of variation is :

(1) 250% (2) 25% (3) 40% (4) 400%

15. The mean of a random variable x was 35, then the mean of $5 + 2x$ is :

(1) 35 (2) 70 (3) 75 (4) 60

16. If the birth weight of each of 20 babies born in a hospital in a day is found to be 2.6 kg. Then the SD of this sample will be :

(1) 0 (2) 1 (3) 2.8 (4) 26

17. The average gestation of 5 full-term deliveries is 40 weeks, If the gestations of four of them full-term deliveries are :

37, 41, 39, 42 weeks, then the 5th delivery was of gestation :

(1) 40 weeks (2) 39 weeks (3) 38 weeks (4) 41 weeks

18. The value of coefficient of Kurtosis β_2 can be :

(1) less than 3 (2) greater than 3

(3) equal to 3 (4) all of the above

19. If a moderately skewed distribution has mean 40 and median equal to 30, the mode of the distribution is :

(1) 10 (2) 35 (3) 20 (4) 25

20. In case of positive skewed distribution, the relation between mean, median and mode that holds is :

(1) median > mean > mode (2) mean > median > mode

(3) mean = median = mode (4) mean = median < mode

21. Scatter diagram is helpful in :

(1) computing the extent of correlation between two variables

(2) establishing the mathematical relationship between two variables

(3) determining the nature of correlation between two variables

(4) all of the above

22. The correlation coefficient ρ of 20 observations of each of variables X and Y were 0.2, then the correlation coefficient of $2 + 7X$ and $3 + 2Y$ is :

(1) 0.4 (2) 0.9 (3) 0.5 (4) 0.2

23. 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) -0.5 (2) 0.5 (3) $\frac{1}{4}$ (4) $-\frac{1}{4}$

24. To fit a curve $Y = ab^x$ by the method of least squares, the linear equation is :

(1) $\log Y = \log a + bx$ (2) $Y = \log a + x \log b$

(3) $Y = a + x \log b$ (4) $\log Y = \log a + x \log b$

25. The ranks of the two variable are given below :

X : 1 2 3 4 5

Y : 5 4 3 2 1

the rank correlation coefficient is :

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

26. Which of the following relation is true ?

(1) $r_{12.34} = r_{13.24}$ (2) $r_{13} = r_{23}$ (3) $r_{12.3} = r_{21.3}$ (4) $r_{12.3} = r_{13.2}$

Where notations have their usual meanings.

27. If the rank correlation coefficient between marks in physics and chemistry for a group of students is 0.8 and the sum of squares of the differences in ranks is 33. What is the number of students in the group ?

(1) 10 (2) 11 (3) 9 (4) 12

28. It is given that $r_{12} = 0.7$, $r_{13} = 0.5$ and $r_{23} = 0.4$, where r_{ij} is the correlation between (X_i and X_j, $(i, j) = 1, 2, 3$. Then the partial correlation between (X_1, X_2) given X_3 is :

(1) 0.25 (2) 0.50 (3) 0.63 (4) 0.75

29. Regression equations are obtained by using :

(1) minimum chi-square method (2) product moment method

(3) least square method (4) concurrent deviation method

30. Correlation coefficient $\rho = 1$ shows that the association between the factors :

(1) is perfect (2) is low (3) is high (4) does not exist

31. The probability of all possible outcomes of a random experiment is always equal to :

(1) 0 (2) 1 (3) ∞ (infinity) (4) none of these

32. The probability of the intersection of two mutually exclusive events is always :

(1) 0 (2) 1 (3) ∞ (infinity) (4) none of these

33. If A is an event, the conditional probability of A given A is equal to :

(1) ∞ (infinity) (2) 0

(3) 1 (4) indeterminate quantity

34. In a hospital on an average 1 patient dies within a day after operation, then the probability of at least 1 death a day is :

(1) 0.3679 (2) 0.5135 (3) 0.1353 (4) 0.6321

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

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

36. Given that $P(A)=\frac{1}{3}, P(B)=\frac{3}{4}$ and $P(A \cup B)=\frac{11}{12}$, the probability $P(B \mid A)$ is :

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

37. A physician after examining a group of persons for a certain condition classifies each one as 'Normal', Mild', 'Moderate' & 'Severe', what scale of measurement that is being adopted ?

(1) Normal (2) Interval (3) Ratio (4) Ordinal

38. For a post in a factory, husband and wife both applied. The probability of selection of a male is $\frac{1}{5}$ and that of a female is $\frac{1}{3}$. The probability of selection of only one of them is :

(1) 2/5 (2) 2/15 (3) 4/15 (4) 8/15

39. In a binomial distribution, mean is k times the variance. What is the value of inverse of k ?

(1) p (2) $(1-p)$ (3) $1/p$ (4) $1/(1-p)$

40. The inverse of coefficient of variation of Poisson distribution with parameter λ is :

(1) $1/\sqrt{\lambda}$ (2) 1 (3) $\sqrt{\lambda}$ (4) $1/\lambda$

41. A discrete random variable has the probability mass function $f(x) = kx$, $x = 0, 1, 2, 3, 4$, then k is equal to :

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

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

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

43. If the probability density function of the random variable x is :

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}, \quad -\infty < x < \infty, \sigma > 0, \quad -\infty < \mu < \infty$$

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

then the probability $P\left(x = \frac{1}{4}\right)$ is

(1) 0.25 (2) 0 (3) 0.75 (4) $\frac{1}{2}$

44. For an exponential distribution with probability density function :

$$f(x) = \frac{1}{2} e^{-\frac{x}{2}};\ x \geq 0$$
$$= 0, \text{ otherwise}$$

its mean and variance are :

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

45. The points of inflexion of a normal distribution $N(\mu, \sigma)$ are :

(1) $\mu \pm 0.5\,\sigma$ (2) $\mu \pm 3\,\sigma$ (3) $\mu \pm 2\,\sigma$ (4) $\mu \pm \sigma$

46. The mode of the geometric distribution $\left(\frac{1}{2}\right)^x$ for $x = 1, 2, 3, \ldots\ldots$, is :

(1) 1 (2) 0 (3) $\frac{1}{2}$ (4) does not exist

47. If a random variable X has the following probability distribution :

x	:	-1	-2	1	2
$P(X = x)$	:	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{3}$

Then the expected value of X is :

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

48. If $f(x, y) = 3 - x - y$ for $0 \leq x, y \leq 1$, the marginal distribution of X is :

(1) $f_x(x) = 3 - x$ (2) $f_x(x) = \frac{5}{2} - x$ (3) $f_x(x) = 5 - \frac{x^2}{2}$ (4) None of these

49. If X and Y are two random variables, then which one of the following relations defines Cov(X, Y) ?

(1) $E(XY) + E(X)\,E(Y)$ (2) $E(XY) - E(X)$

(3) $E(XY) - E(X)\,E(Y)$ (4) $E(XY) - E(Y)$

50. Which one of the following statement is ***not*** correct ?

(1) $\int_{-\infty}^{\infty} f(x)\,dx = 1$ (2) $\frac{dF(x)}{dx} = f(x)$

(3) $f(x) \geq 0$ (4) None of these

51. If x and y are two random variables having joint probability density function $f(x, y) = \frac{1}{8}(6 - x - y), 0 < x < 2, 2 < y < 4$, the value of $P(x < 1, y < 3)$ is :

(1) $\frac{3}{8}$ (2) $\frac{5}{24}$ (3) $\frac{1}{8}$ (4) $\frac{3}{10}$

52. A negative binomial variate has probability mass function,

$$f(x) = \binom{n+x-1}{x} q^x p^n ; x = 0, 1, 2, \ldots\ldots\ldots$$

with its mean = 2 and variance = 3. The value of p is equal to :

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

53. If a continuous random variable X has probability density function :

$$f(x) = \frac{1}{3};\ -1 \leq x \leq 0$$

$$= \frac{2}{3};\ 0 \leq x \leq 1$$

then $E(X^2)$ is equal to :

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

54. If $f(x)$ is the probability density function of a random variable X, $a \leq x \leq b$, then the mean deviation about a point $x = A$ is least when it is measured from :

(1) median (2) arithmetic mean

(3) geometric mean (4) mode

55. A function of the sample values for estimating a parameter is celled :

(1) a statistic (2) an estimate (3) an estimator (4) frame

56. The standard deviation of the sampling distribution of a statistic is known as its :

(1) Standard deviation (2) Standard error

(3) Root mean square deviation (4) Mean deviation

57. The standard error of sample mean for large samples is given by :

(1) $\frac{\sigma}{\sqrt{(n-1)}}$ (2) $\frac{\sigma}{\sqrt{(n+1)}}$ (3) $\frac{\sigma}{\sqrt{n}}$ (4) $\frac{\sigma}{(n-1)}$

Where n is the sample size and σ^2 is the population variance.

58. The standard error of observed sample proportion for large samples is given by :

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

59. The probability of rejecting H_0 when H_0 is true is :

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

60. The hypothesis under test is a :

(1) Simple hypothesis (2) Alternative hypothesis

(3) Null hypothesis (4) Composite hypothesis

61. Which one of the following statements is true ? The P-value is :

(1) The probability that the null hypothesis is true

(2) The probability that the alternative hypothesis is true

(3) The probability of obtaining the observed or more extreme results if the alternative hypothesis is true

(4) The probability of obtaining the observed results or results which are more extreme if the null hypothesis is true

62. Power of a test is related to :

(1) Type-I error (2) Type-II error

(3) Both Type-I and Type-II errors (4) None of these

63. For a sample of 12 paired observations, the coefficient of correlation is obtained to be 0.50. To test the hypothesis that the population correlation coefficient is zero, the test of significance used is :

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

64. Assuming the normal distribution, suppose that a 95% confidence interval for μ is (50, 60). Which one of the following could possibly be a 99% confidence interval ?

(1) (54, 60) (2) (54, 64) (3) (48, 62) (4) (48, 60)

65. 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 of the above

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

(1) run test (2) sign test (3) median test (4) t-test

67. The number of runs and expected value of runs in XYYXYXX are respectively :

(1) (2, 3.4) (2) (3, 4.4) (3) (5, 3.4) (4) (5, 4.2)

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

(1) t-test (2) Z-test

(3) Chi-square test (4) F-test

69. If $x \geq 1$, is the critical region for testing $H_0 : \theta = 2$ against the alternative $\theta = 1$, on the basis of the single observation from the population,

$$f(x, \theta) = \theta \exp(-\theta x), x \geq 0$$

then the value of α(= size of type I error) is :

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

70. Given the probability density function

$$f(x) = \frac{1}{\theta}, 0 \leq x \leq \theta$$

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

If $x \geq 0.5$ is the critical region for testing $H_0 : \theta = 1$ versus $H_1 : \theta = 2$ by means of a single observed value of x, then the power of test is :

(1) 0.975 (2) 0.50 (3) 0.75 (4) 0.025

71. The distribution of the test statistic used in median test is :

(1) Uniform (2) t

(3) Hyper geometric (4) Chi-square

72. If we consider 1000 persons and record their status as smokers and non smokers and assess them regarding their suffering from CHD problem (absent or present), the used conventional chi-square test will be known as :

(1) Chi-square test of goodness of fit (2) Chi-square test of trend

(3) Chi-square test of independence (4) Chi-square test of heterogeneity

73. A sample consists of :

(1) all units of the population (2) 50 percent units of the population

(3) 5 percent units of the population (4) any fraction of the population

74. Sampling is inevitable in the situation(s) :

(1) blood test of a person (2) when the population is infinite

(3) testing of life of dry battery cells (4) all of the above

75. For simple random sampling without replacement, the variance of the sample mean is :

(1) $\frac{(N-1)}{N}.\frac{S^2}{n}$ (2) $\frac{(N-n)}{N}.\frac{S^2}{n}$ (3) $\frac{(N-n)}{(N-1)}\frac{S^2}{n}$ (4) $\frac{N}{(N-n)}.\frac{S^2}{n}$

where notations have their usual meanings.

76. The interaction effect can not be studied if the number of observation per cell is :

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

77. Sample of size n are drawn from a population of size N according to simple random sampling without replacement. Then the number of possible samples be :

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

78. Systematic sampling method is :

(1) purposive sampling

(2) equal probability sampling

(3) mixture of purposive and probability sampling

(4) unequal probability sampling

79. A population is divided into three strata, consisting of 20, 30 and 50 units, if a sample size is 40 units, then the number of units drawn from respective strata with proportional allocation are :

(1) 4, 16, 20 (2) 8, 12, 20 (3) 6, 12, 22 (4) 8, 20, 12

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

(1) must be equal (2) former is greater than the latter

(3) should not be equal (4) None of these

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

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

(3) random systematic sampling (4) all of the above

82. What precaution(s) make(s) cluster sampling more efficient ?

(1) by taking clusters of small size

(2) choosing clusters having largest within variation

(3) choosing clusters having least between variation

(4) all of the above

83. The experimental design is 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

84. The number of degrees of freedom in 3 × 3 Latin square design for treatments is :

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

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

(1) Experiments (2) Replications

(3) Blocks (4) All of the above

86. 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 decreases

(3) The standard deviation to decrease

(4) The sample variance to decrease

87. 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, c, b, a, ac, ab, bc, abc (4) 1, a, b, ab, c, ac, bc, abc

88. Local control is used to :

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

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

89. In statistics the most commonly used frequency distribution has :

(1) mean, mode and median

(2) mean is less than median but more than mode

(3) mean is less than mode but more than median

(4) mean may be more than median and mode

90. Suppose a systematic sample of size 5 is to be selected from a population of size 20. If the random number drawn is 4, then the sample will consist of units :

(1) 4, 8, 12, 17, 20 (2) 4, 8, 13, 17, 20

(3) 4, 8, 12, 16, 20 (4) 4, 7, 12, 15, 19

91. If interaction AB is confounded in 2^3 factorial experiment, the entries of two blocks in a replicate will be :

(1)

b	*ac*	*bc*	*a*	I
(1)	*ab*	*c*	*abc*	II

(2)

(1)	*ab*	*a*	*b*	I
abc	*c*	*bc*	*ac*	II

(3)

(1)	*ab*	*ac*	*bc*	I
abc	*a*	*b*	*c*	II

(4)

abc	*bc*	*ac*	*c*	I
ab	*a*	*b*	(1)	II

92. In a completely randomized design with t treatments and n experimental units, error degrees of freedom is equal to :

(1) $t-n$ (2) $n-t$ (3) $n-t-1$ (4) $n-t+1$

93. A sample of 16 items from an infinite population having standard deviation $\sigma = 4$ yielded total scores as 160. The standard error of sampling distribution of mean is :

(1) 10 (2) 40 (3) 1 (4) 0.25

94. 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) $s_w^2 \geq s_w^2$ (2) $s_w^2 = s_b^2$ (3) $s_w^2 \leq s_b^2$ (4) None of these

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

(1) vital statistics (2) census (3) demography (4) None of these

96. Census of India is organized by :

(1) Registrar-General of India

(2) Planning Commission

(3) Central Statistical Organization

(4) National Sample Survey Organisation

97. Crude birth rate (CBR) usually lies between :

(1) 10 and 35 per thousand (2) 15 and 40 per thousand

(3) 15 and 45 per thousand (4) 10 and 55 per thousand

98. 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) 2230 (4) 2676

99. For net reproduction rate (NRR) and gross reproduction rate (GRR) which statement is ***not*** true :

(1) NRR $\leq$ GRR (2) $0 \leq$ NRR ≤ 5 (3) NRR > GRR (4) None of these

100. To get an idea about the fertility variation, the following is used :

(1) Above one year of age (2) Mothers of fertile age

(3) Less than one year of age (4) Population of 15-49 years age

101. The fertility of a woman in India is maximum in the age group :

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

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

(1) Net reproduction rate (NRR)
(2) Total fertility rate
(3) Gross reproduction rate (GRR)
(4) Crude birth rate

103. The death rate obtained for a segment of a population is known as :

(1) standardized death rate
(2) Vital index
(3) Crude death rate
(4) Specific death rate

104. NRR = 1 leads one to conclude that :

(1) female population will exactly replace itself
(2) population has a tendency to remain more or less constant
(3) there is no mortality in female births till their child bearing age
(4) all of the above

105. The ratio of the number of children of age less than life years to the total number of women of 15-49 year age is called :

(1) NRR
(2) Vital index
(3) GRR
(4) Replacement index

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

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

107. The quantity

$$ {}_{n}^{f}\pi_x = \frac{{}_{n}^{f}L_x}{f_{l_0}} $$

gives the life table probability of survival of a female to the age-interval x to $x + n$ and is called :

(1) female age-specific fertility rate (2) survival rate

(3) crude rate of natural increase (4) crude birth rate

108. A population having constant size and age and sex composition is celled :

(1) discrete population (2) continuous population

(3) stable population (4) stationary population

109. Crude death rate usually lies between :

(1) 8 and 30 per thousand (2) 10 and 40 per thousand

(3) 20 and 50 per thousand (4) 8 and 50 per thousand

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

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

111. If GRR is less than unity,

(1) the population declines if crude death rate (CDR) is low

(2) the population declines if CDR is high

(3) the population declines no matter how low its death rate may be

(4) the population increases no matter what the death rate may be

112. The probability of living a person in the age group x to $(x + n)$ can be obtained by the formula :

(1) $\frac{l_{x+n}}{l_x}$ (2) $\frac{(l_x - l_{x+n})}{l_x}$ (3) $\frac{(l_x - l_{x+n})}{l_{x+n}}$ (4) $\frac{l_x}{l_{x+n}}$

113. The annual age-specific fertility rate is given by :

(1) $i_x = \frac{f_B}{B}$ (2) $i_x = \frac{B_x}{f_{P_x}} \times k$ (3) $i_x = \frac{B_x}{\sum_x f_{P_x}} \times k$ (4) None of these

where notations have their usual meanings.

114. Gompertz's curve was found to give good fit only for ages :

(1) below 30 (2) for the entire span of life

(3) beyond 30 (4) between 20 and 29

115. Makeham's curve was found to be useful only for ages :

(1) below 20 (2) beyond 20

(3) beyond 30 (4) between 18 and 20

116. The age standardized death rate for city A by direct method of standardisation is :

(1) $\frac{\sum_x m_x^a P_x^s}{\sum_x P_x^s}$ (2) $\frac{\sum_x m_x^a P_x^a}{\sum_x P_x^a}$ (3) $\frac{\sum_x m_x^s P_x^s}{\sum_x P_x^a}$ (4) $\frac{\sum_x m_x^s P_x^a}{\sum_x P_x^a}$

Where notations have their usual meanings.

117. The central mortality rate 'm_x' in terms of q_x is given by the formula :

(1) $\frac{2q_x}{2+q_x}$ (2) $\frac{q_x}{2}\left(1+\frac{q_x}{2}\right)^{-1}$ (3) $\frac{q_x}{2}\left(1-\frac{q_x}{2}\right)^{-1}$ (4) $\frac{2q_x}{2-q_x}$

118. The geometrical 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. The geometric significance of Simpon's $\frac{1}{3}$-rule is that we replace the graph of the given function by $\frac{n}{2}$ arcs of :

(1) third-degree (2) fourth-degree

(3) fifth-degree (4) second-degree

polynomials with vertical axes.

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

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

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

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

122. 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

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

(1) outside the series

(2) in the beginning

(3) at the end

(4) in the middle of the central interval

124. If the arguments in a series are not at equal interval, proper formula that can be used for interpolation is :

(1) Bessel's formula
(2) Lagrange's formula
(3) Stirling's formula
(4) Newton's formula

125. If the interpolating value lies near the middle of the central interval, then the most exact formula is :

(1) Bessel's interpolation formula
(2) Lagrange's interpolation formula
(3) Newton's divided difference interpolation formula
(4) Newton-Gauss interpolation

126. Which of the following relation amongst finite differences is ***not*** correct ?

(1) $\Delta^3 y_{-1} - \Delta^3 y_{-2} = \Delta^4 y_{-2}$

(2) $\Delta^2 y_{-1} - \Delta^2 y_0 = \Delta^3 y_0$

(3) $\Delta y_2 - \Delta y_1 = \Delta^2 y_1$

(4) $y_2 - y_1 = \Delta y_1$

127. The Newton-Gregory backward interpolation formula is generally used to interpolate the values :

(1) near the end of a set of a table values
(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

128. Interpolation formulae are based on assumption :

(1) the missing value is linearly based on the values

(2) the missing value is parabolically based on other values

(3) the missing value is moving average and based on other values

(4) the missing value related with some logic and other values

129. Divided differences are useful when :

(1) arguments are equally spaced

(2) arguments are unequally spaced

(3) arguments advance with unit intervals

(4) all of the above

130. If the temperature of three dates of June, 2010 were as follows :

Dates : 1 10 25

Temp.(°C) : 33 38 46

The estimated temperature for 20th June, 2010 by divided difference method is :

(1) 43.37 (2) 42.37 (3) 43.73 (4) 39.0

131. Consider the rectangular distribution $f(x, \theta) = \frac{1}{\theta}$, $0 < x \leq \theta$, $\theta > 0$, the maximum likelihood estimator of θ based on a random sample $x_1, x_2, \ldots\ldots, x_n$ is :

(1) $\overline{X}$ (2) X_n

(3) min.$(x_1, x_2, \ldots\ldots, x_n)$ (4) max. $(x_1, x_2, \ldots\ldots, x_n)$

132. Let T_1 and T_2 be two unbiased estimators of θ. Then $k_1 T_1 + k_2 T_2$ is also an unbiased estimator of θ for :

(1) no values of k_1, k_2 (2) all values of k_1, k_2

(3) all equal values of k_1, k_2 (4) None of these

133. The mean square error of an estimator t of the parameter θ is defined by :

(1) $E\{(t-\theta)^2\}$ (2) $E\{(t-E(t))^2\}$

(3) $\text{Var}(t) - (\text{Bias}\ (t))^2$ (4) None of these

134. Let $X_1, X_2 \ldots\ldots, X_n$ be a random sample from normal distribution $N(\theta, 1)$, then the minimum variance unbiased estimator (MVUE) of θ^2 is :

(1) $\overline{X}^2 - \frac{1}{n}$ (2) $\overline{X}^2$ (3) $\overline{X}^2 + \frac{1}{n}$ (4) $n\overline{X}^2$

135. Bias of an estimator can be :

(1) positive (2) negative

(3) either positive or negative (4) always zero

136. Simple consistency of an estimator T_n for $\tau(\theta)$ means :

(1) $P_\theta\{|T_n - \tau(\theta)| > \epsilon\} = 1$

(2) $\lim_{n\to\infty} P_\theta\{|T_n - \tau(\theta)| < \epsilon\} = 1$

(3) $\lim_{n\to\infty} P_\theta\{|T_n - \tau(\theta)\} < \epsilon\} = 0$

(4) None of these

137. Mean squared error of an estimator T_n of $\tau(\theta)$ is minimum only if :

(1) bias and Var(T_n) both are zero

(2) bias is zero and Var(T_n) is minimum

(3) bias is minimum and Var(T_n) is zero

(4) None of these

138. If t_n and t_n^* are two unbiased estimators of $\tau(\theta)$ based on the random sample $x_1, x_2, \ldots, x_n$, then T_n is said to be UMVUE if and only if :

(1) $\text{Var}(t_n) \geq \text{Var}(t_n^*)$ (2) $\text{Var}(t_n) \leq \text{Var}(t_n^*)$

(3) $\text{Var}(t_n) = \text{Var}(t_n^*)$ (4) None of these

139. Let $x_1, x_2, \ldots\ldots\ldots, x_n$ be a random sample of small size from a normal population with mean μ and variance σ^2 (known). To $H_0 : \mu = \mu_0$ we employ :

(1) t-test (2) F-test

(3) Chi-square test (4) normal test

140. Below are given the gain in weights (in lb_s) of pigs fed on two diets A and B.

Diet A : 25, 32, 30, 34,

Diet B : 44, 34, 22, 10, 47

To test the hypothesis that there is no significant difference between the mean increase in weights due to diet A and B we employ :

(1) normal test (2) F-test

(3) t-test (4) paired t-test

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

(1) Method of moments
(2) Method of invariance
(3) Method of least squares
(4) Method of maximum likelihood

142. There are large number of classes and we want to know whether all the class effects are equal or not. For this, appropriate analysis would be given by :

(1) One-way classification with fixed effect model
(2) Two-way classification with fixed effect model
(3) One-way classification with random effect model
(4) Two-way classification with random effect model

143. If the confidence coefficient is $(1 - \alpha)$, the best interval estimator of μ in $N(\mu, 1)$ is :

(1) $\bar{x} \pm \frac{1}{\sqrt{n}} Z_{\frac{(1-\alpha)}{2}}$

(2) $\bar{x} \pm \frac{1}{\sqrt{n}} Z_{\frac{\alpha}{2}}$

(3) $\left\{ \bar{x} - \frac{1}{\sqrt{n}} Z_{\frac{(1-\alpha)}{2}}, \bar{x} + \frac{1}{\sqrt{n}} Z_{\frac{\alpha}{2}} \right\}$

(4) $\left\{ \bar{x} - \frac{1}{\sqrt{n}} Z_{\frac{\alpha}{2}}, \bar{x} + \frac{1}{\sqrt{n}} Z_{\frac{(1-\alpha)}{2}} \right\}$,

where notations have their usual meanings.

144. With reference to likelihood ratio test, under certain conditions, $-2 \log_e \lambda$ has an asymptotic :

(1) Chi-square distribution
(2) normal distribution
(3) t-distribution
(4) Cauchy distribution

145. Let $(x_1, x_2, ..., x_n)$ be a random sample of size n from the normal population with mean μ and variance σ^2, where μ and σ^2 are unknown. Suppose we want to test the (composite) null hypothesis :

$$H_0 : \mu = \mu_0 \text{ (specified)}, 0 < \sigma^2 < \infty$$

against the composite alternative hypothesis

$$H_1 : \mu \neq \mu_0; 0 < \sigma^2 < \infty$$

then the criterion for the likelihood ratio test under H_0 is :

(1) $\lambda = \left(1 + \frac{t^2}{n-1}\right)^{\frac{n}{2}}$ (2) $\lambda = \left(1 + \frac{t^2}{n}\right)^{-\frac{n}{2}}$

(3) $\lambda = \left(1 + \frac{t^2}{n-1}\right)^{-\frac{n}{2}}$ (4) $\lambda = \left(1 + \frac{t^2}{n}\right)^{\frac{n}{2}}$

where notations have their usual meanings.

146. The probability that a person suffering from migraine headache will obtain relief with a particular drug is 0.9. Three randomly selected sufferers from migraine headache are given the drug. Then the probability that the exactly one sufferer will get relief is :

(1) 0.271 (2) 0.021 (3) 0.221 (4) 0.027

147. In a certain population of hospital patients the probability is 0.35 that a randomly selected patient will have heart disease. The probability is 0.86 that a patient with heart disease is a smoker. What is the probability that a patient randomly selected from the population will be a smoker and have heart disease ?

(1) 0.301 (2) 0.086 (3) 0.035 (4) 0.121

148. The following are the SLP values obtained from a sample of 10 apparently healthy adults :

4.07, 2.71, 3.64, 3.37, 3.84, 3.83, 3.82, 4.21, 4.04, 4.50.

Then the median is :

(1) 3.85 (2) 3.835 (3) 5.25 (4) 3.583

149. A physical therapist wished to compare three methods for teaching patients to use a certain prosthetic device. He felt that the rate of learning would be different for patients of different ages and wished to design an experiment in which the influence of age could be taken into account. The following design is an appropriate design for this therapist :

(1) 3 × 3 LSD (Latin square design)

(2) Completely randomized design

(3) Randomized complete block design

(4) Incomplete randomized block design

150. If the sample values are 1, 3, 5, 7, 9 the standard error of the sample mean is :

(1) $\sqrt{2}$ (2) $\frac{1}{\sqrt{2}}$ (3) 2.0 (4) $\frac{1}{2}$

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 रें। 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।