M.Sc Health Stats code no (275)

16P/211/10 Question Booklet No. 179

(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 OMR Answer Sheet ..... (2019)

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 also Roll No. and OMR Sheet No. on the Question Booklet.
7. Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfair means.
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 mark).
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 गए हैं]

[No. of Printed Pages : 28+2

No. of Questions : 150

Time : 2½ Hours **Full Marks :** 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.

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

1. Data taken from the publication, 'Agricultural Situation in India' will be considered as

(1) primary data

(2) secondary data

(3) primary and secondary data

(4) neither primary nor secondary data

2. Data can be well-displayed or presented by way of

(1) cross-classification (2) stem and leaf display

(3) two or more dimensional table (4) All of the above

3. Incubation periods (in days) of 9 cholera patients are 20, 5, 3, 10, 16, 10, 15, 10, 2. Mode incubation period will be

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

4. If the birth weight of each of 10 babies born in a hospital in a day is found to be 2·90 kg, then standard deviation of this sample will be

(1) 29 (2) 2·90 (3) 0 (4) 3·0

5. If X is a random variable representing haemoglobin levels of pregnant women, then the transformed variable $Z = \frac{(X - \mu)}{\sigma}$ has

(1) mean 0 and variance 1

(2) normal distribution with mean 0 and variance 1

(3) mean μ and variance 1

(4) mean 0 and variance σ^2

where notations have their usual meanings.

6. Weight of randomly selected newborn babies $X \sim N(\mu, \sigma^2)$, then $Y = (X - \mu)$ has

(1) mean 0 and variance σ^2

(2) mean μ and variance σ^2

(3) $Y \sim N(\mu, \sigma^2)$

(4) $Y \sim N(0, \sigma^2)$

7. A bar chart

(1) is 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

8. State whether the data reflecting heights of individuals in the general population are likely to be

(1) skewed to the right (2) skewed to the left

(3) symmetrical (4) None of the above

9. The value of $3 \log_{10} 1000 + 2 \log_{10} 100$ is

(1) 13 (2) 15 (3) 19 (4) 5

10. 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) 20 (4) 25

11. The arithmetic mean of two numbers is 10 and their geometric mean is 8. Then the numbers are

(1) (8, 8) (2) (12, 8) (3) (16, 4) (4) (10, 10)

12. The mean and median of a set of data are 25 and 27 respectively, if the lowest and highest observations are reduced by three, then the value of the median will be

(1) 23 (2) 25 (3) 29 (4) 27

13. The data relating to the number of registered allopathic and homeopathic doctors in six different States can be most appropriately represented by diagram

(1) line graph

(2) histogram

(3) pie-diagram

(4) double bar diagram

14. The weighted mean of n natural numbers if weights are the corresponding numbers is

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

15. There are $(n+1)$ observations in a sample. If $\bar{x}_1$ is the mean of the first n numbers and $\bar{x}_2$ is the mean of the last n numbers, then which of the following is true?

(1) $(\bar{x}_1 - \bar{x}_2) = (x_{n+1} - x_1)$

(2) $\bar{x}_2 = \bar{x}_1 - \frac{1}{n}(x_{n+1} - x_1)$

(3) $n(\bar{x}_1 - \bar{x}_2) = (x_1 - x_{n+1})$

(4) $n(\bar{x}_2 - \bar{x}_1) = (x_1 - x_{n+1})$

16. A student goes to his college from house at the speed of 10 km/hour and comes back at the speed of 15 km/hour, then his average speed is (in km)

(1) 12 (2) 12·25 (3) 12·50 (4) 14

17. The sum of squares of the deviations of a set of values is least when measured about

(1) geometric mean

(2) mean

(3) median

(4) mode

18. 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 fifth delivery was of gestation

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

19. Among 1000 patients of road accidents, median alcohol intake was observed as 200 ml. How many of these patients will be found with an intake of more than 200 ml?

(1) 10 (2) 100 (3) 500 (4) 499

20. Coefficient of variation has

(1) no unit
(2) same unit as mean
(3) same unit as variance
(4) same unit as standard deviation

21. The standard deviation of a variable X is known to be 10. The standard deviation of $50 + 5X$ is

(1) 100 (2) 50 (3) 25 (4) 10

22. For any two events A and B, the value of $P(A \cup B)$ is

(1) $P(A)+P(B)+P(A \cap B)$
(2) $P(A)+P(B)$
(3) $P(A)+P(B)-P(A \cap B)$
(4) $P(A)-P(A \cap B)$

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

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

(P.T.O.)

24. If $P(A \cup B) = \frac{5}{8}$ and $P(B) = \frac{1}{4}$, then

(1) $P(A) \leq \frac{3}{8}$ (2) $P(A) \geq \frac{3}{8}$ (3) $P(A) \geq \frac{27}{32}$ (4) $P \geq \frac{1}{4}$

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

(1) infinity (2) zero (3) one (4) half

26. A can hit a target 2 times in 5 shots, B 3 times in 5 shots and C 4 times in 5 shots. They fire a volley (each try once to hit the target). The probability that two shots hit is

(1) $\frac{58}{125}$ (2) $\frac{24}{125}$ (3) $\frac{67}{125}$ (4) $\frac{121}{125}$

27. If A and B are two independent events such that $P(A) = P(B) = 0 \cdot 8$, then $P(A \cup B)$ is equal to

(1) 0·16 (2) 0·80 (3) 0·64 (4) 0·96

28. If $P(A \cup B) = \frac{5}{6}$, $P(A \cap B) = \frac{1}{3}$ and $P(B) = \frac{1}{2}$, then $P(A)$ is

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

29. The probability of drawing a white ball in the first draw and again a white ball in the second draw with replacement from a bag containing 6 white and 4 blue balls is

(1) $\frac{1}{5}$ (2) $\frac{3}{5}$ (3) $\frac{9}{25}$ (4) $\frac{1}{25}$

30. For a post of Assistant Professor in a college 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) $\frac{2}{5}$ (2) $\frac{2}{15}$ (3) $\frac{4}{15}$ (4) $\frac{7}{15}$

31. If a *continuous* random variable X has probability density function

$$f(x) = \frac{3x(2-x)}{4}, \quad 0 \le x \le 2$$
$$= 0, \quad \text{otherwise}$$

then $P(X<1)$ is

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

32. Let X be a random variable with the following probability distribution

x	-3	6	9
$P(X=x)$	$\frac{1}{6}$	$\frac{1}{2}$	$\frac{1}{3}$

Then the value of $E(X)$ is

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

33. *Two random variables* X and Y with joint probability density function $f(x, y)$ and marginal probability density functions $f(x)$ and $g(y)$ respectively are said to be stochastically independent if and only if

(1) $f(x, y) = g(y)$

(2) $f(x, y) = f(x) / f(y)$

(3) $f(x, y) = f(x)$

(4) $f(x, y) = f(x)\, g(y)$

34. If $f(x)$ is the probability density function of a continuous random variable X, where $X \in [a, b]$, then the rth moment about mean (μ) is

(1) $\int_{x=a}^{x=b} (x-\mu)^r f(x)\,dx$ (2) $\int_{x=a}^{x=b} (x-\mu)^r\,dx$

(3) $\int_{x=a}^{x=b} (x-\mu)^r f(x)$ (4) $\int_{x=a}^{x=b} (x/\mu)^r\,dx$

35. Which one of the following statements is not correct?

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

(3) $f(x) \geq 0$ (4) $f(x) < 0$

where $f(x)$ and $F(x)$ are the probability density function and probability distribution function of the continuous random variable X respectively.

36. A random variable y has the probability mass function

$$p(y) = \begin{cases} c^2 y^2 & , \text{ for } y = -2, -1, 1, 2 \\ 0 & , \text{ otherwise} \end{cases}$$

then the value of c will be

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

37. If the first and third quartiles are 30 and 70 respectively, then the coefficient of dispersion will be

(1) 0·40 (2) $\frac{7}{3}$ (3) $\frac{3}{7}$ (4) 40

38. What do you understand by OGIVE?

(1) Symmetrical curve (2) Asymmetrical curve

(3) Bimodal curve (4) Cumulative frequency curve

39. The long-term movements in a time series are called

(1) seasonal variations (2) trends

(3) cyclic variations (4) random variations

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

(1) Simple random sampling (2) Stratified sampling

(3) Quota sampling (4) Systematic sampling

41. For any two events A_1 and A_2, if $P(A_1) = \frac{2}{3}$, $P(A_2) = \frac{3}{8}$ and $P(A_1 \cap A_2) = \frac{1}{4}$, then A_1 and A_2 are

(1) independent but not mutually exclusive

(2) mutually exclusive and independent

(3) mutually exclusive but not independent

(4) not mutually exclusive and not independent

42. If a random variable X has the probability density function

$$f(x) = \frac{1}{\beta^{\alpha}\Gamma\alpha} x^{\alpha-1} \exp(-x/\beta); x \geq 0$$

then the value of $E(X^2)$ is

(1) $\alpha\beta^2(\alpha - 1)$ (2) $\alpha^2\beta(\alpha + 1)$ (3) $\alpha^2\beta^2$ (4) $\alpha\beta^2(\alpha + 1)$

43. Height and weight of children have the correlation

(1) zero (2) one (3) positive (4) negative

44. The correlation coefficient lies between

(1) -1 and 0 (2) 1 and 0 (3) 0 and ∞ (4) -1 and 1

45. Regression equations are obtained by using

(1) product moment method (2) concurrent duration method

(3) least square method (4) normal equation method

46. If $P(A) = P(B) = \frac{1}{3}$ and $P(A \cap B) = \frac{1}{40}$, then the probability of an event in which either A occurs or B occurs but A and B do not occur simultaneously, is

(1) $\frac{2}{3}$ (2) $\left(\frac{2}{3} - \frac{1}{40}\right)$ (3) $\left(\frac{2}{3} - \frac{3}{40}\right)$ (4) $\left(\frac{2}{3} - \frac{1}{20}\right)$

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

(1) less than one (2) greater than one

(3) equal to one (4) equal to 'zero'

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

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

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

49. The coefficient of correlation between x and y is 0·6. The coefficient of correlation between $2x+7$ and $21-4y$ will be

(1) -1 (2) 1 (3) 0·6 (4) $-0\cdot6$

50. If x and y are two standard normal variates and ρ is the correlation coefficient between (x, y), then the correlation coefficient between $(x+y)$ and $(x-y)$ is

(1) 0 (2) ρ (3) $-\rho$ (4) 1

51. If the rank correlation coefficient between marks in Physics and Chemistry for a group of students is 0·4 and the sum of squares of the differences in ranks is 72, what is the number of students in the group?

(1) 10 (2) 9 (3) 11 (4) 8

52. In a beauty contest there were 10 competitors. Ranks to these candidates were assigned by two judges A and B. The sum of squares of differences of ranks is 44. What is the value of the rank correlation coefficient?

(1) 0·60 (2) 0·70 (3) 0·73 (4) 0·80

53. The geometric mean of three observations 4, 5 and y is 1. The value of y will be

(1) $\frac{1}{9}$ (2) $\frac{1}{5}$ (3) $\frac{1}{4}$ (4) $\frac{1}{20}$

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

(1) $\bar{x}=-0\cdot80, \bar{y}=-1\cdot40$ (2) $\bar{x}=-0\cdot90, \bar{y}=-1\cdot20$

(3) $\bar{x}=0\cdot80, \bar{y}=1\cdot40$ (4) $\bar{x}=0\cdot75, \bar{y}=0\cdot80$

55. It is given that $r_{12} = 0 \cdot 7$, $r_{13} = 0 \cdot 5$ and $r_{23} = 0 \cdot 4$, where r_{ij} is the correlation coefficient 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) 0·75 (2) 0·63 (3) 0·40 (4) 0

56. If the multiple correlation coefficient is zero (i.e. $R_{1 \cdot 23} = 0$), then

(1) X_1 is uncorrelated with X_2 only

(2) X_1 is uncorrelated with X_3 only

(3) X_1 is uncorrelated with both X_2 and X_3

(4) X_2 and X_3 are necessarily uncorrelated

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

(1) $\log Y = \log a + bX$ (2) $\log Y = a - X \log b$

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

58. In cyclic fluctuations, the period of oscillation is

(1) less than a year (2) a year

(3) more than a year (4) None of these

59. The number of positive class frequencies in case of 4 attributes A, B, C, D is

(1) 16 (2) 12 (3) 81 (4) 4

60. The total number of class frequencies of all orders, for n attributes is

(1) 2^{n-1} (2) 3^{n-1} (3) 2^n (4) 3^n

61. The relation between coefficient of association Q and coefficient of colligation Y

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

62. If $N=1000, (A)=600, (B)\,500, (AB)=50$, then the correct statement from the following is

(1) the data is inconsistent

(2) the data is consistent

(3) attributes A and B are independent

(4) attributes A and B are positively associated

63. In case of two attributes A and B, if $(A)=20, (B)=30, N-100$, then to have positive association between A and B, the frequency of the class AB will be

(1) $0<(AB)<6$ (2) $(AB)>6$ (3) $(AB)=0$ (4) $(AB)=6$

64. Salient factors responsible for seasonal variation are

(1) weather

(2) social customs

(3) festivals

(4) All of the above

65. For the given five values 15, 24, 18, 33, 42, the three years moving averages are

(1) 19, 22, 33 (2) 19, 25, 31 (3) 19, 30, 31 (4) 18, 25, 30

66. The moving averages in a time series are free from the influences of

(1) trend and random variations

(2) trend and cyclical variations

(3) seasonal and irregular variations

(4) seasonal and cyclic variations

67. If X and Y are independent random variables, then $V(aX - bY)$ is

(1) $a^2V(X) + 2ab\,\mathrm{cov}(X, Y) + b^2\,V(Y)$

(2) $a^2V(X) - 2ab\,\mathrm{cov}(X, Y) + b^2\,V(Y)$

(3) $b^2V(Y) + a^2$

(4) $a^2V(X) + b^2V(Y)$

68. Weddle's rule is used for

(1) numerical integration
(2) interpolation
(3) numerical differentiation
(4) None of the above

69. The $(n+1)$th difference of a polynomial of degree n is

(1) 'zero'
(2) constant
(3) polynomial of degree n
(4) None of these

70. Lagrange's formula is useful for

(1) interpolation
(2) extrapolation
(3) inverse interpolation
(4) All of the above

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

(1) a polynomial of degree n in x

(2) a polynomial of degree n in y

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

(4) a polynomial with highest degree 1

72. 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) $-0\cdot5$ and 1

(3) $-0\cdot5$ and $0\cdot5$ (4) 0 and 1

73. The order of convergence in Newton-Raphson method is

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

74. The Newton-Raphson method is used to find the root of the equation $x^2 - 2 = 0$. If the iterations are started from -1, the iterations will

(1) converge to -1 (2) converge to $\sqrt{2}$

(3) converge to $-\sqrt{2}$ (4) not converge

75. Let $f(0) = 1$, $f(1) = 2\cdot72$. Then the trapezoidal rule gives approximate value of $\int_0^1 f(x)\,dx$

(1) 3·80 (2) 2·50 (3) 1·25 (4) 1·86

76. A random variable X has mean 3 and variance 2. Then the upper bound for $P[|X-3| \geq 2]$ is

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

77. If the moment generating function of the random variable X is $\exp(3t + 8t^2)$, then the mean and variance of X are

(1) (3, 8) (2) (8, 6) (3) (3, 16) (4) (8, 3)

78. For the following values of $\{x, f(x)\}$

x	:	1951	1961	1971	1981	1991
$f(x)$	:	98000	132000	168000	195000	246000

the value of second-order leading difference is

(1) 36000 (2) 34000 (3) 70000 (4) 2000

79. If the rth moment about origin of a distribution is

$$\mu_r' = \frac{\Gamma(\nu + r)}{\Gamma \nu}$$

then the characteristic function of the distribution is

(1) $(1-it)^{-\nu}$ (2) $(1-it)^{\nu}$ (3) $(1-it)^{\nu-1}$ (4) $(1+it)^{\nu}$

80. In simple random sampling without replacement (SRSWOR), the variance of the sample mean is

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

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

81. A population consisting of 500 units is divided into two strata such that $N_1 = 300$, $N_2 = 200$, $S_1 = 2$ and $S_2 = 3$. If a sample of size 24 is to be allocated by Neyman allocation, then two sample sizes are

(1) (10, 14) (2) (14, 10) (3) (12, 12) (4) (8, 16)

82. Non-sampling error arises in

(1) sampling (2) complete enumeration

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

83. 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, then the number of units drawn from the stratum with 15 units is

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

84. 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 sampling (2) systematic sampling

(3) cluster sampling (4) simple random sampling

85. The coefficient of variation (CV) in a large population is 10%. In order that the CV of sample mean is 2%, the size of the simple random sample should be

(1) 5 (2) 10 (3) 25 (4) 250

86. If the variances of strata are unknown, out of the following allocations the one which is appropriate is

(1) equal allocation (2) proportional allocation

(3) optimum allocation (4) arbitrary allocation

87. If the mean is 230 and the SE is 10, the 95% confidence limits would be

(1) 210-250 (2) 220-240 (3) 225-235 (4) 230-210

88. 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 the above

89. If in a systematic sample of size 10 taken from a population of size 100, the 27th, 87th, 57th, 97th and 7th units of the population are included, then the rest of the five units of the sample are

(1) 10th, 20th, 30th, 40th and 50th units of the population

(2) 1st, 2nd, 3rd, 4rth and 5th units of the population

(3) 17th, 67th, 37th, 77th and 47th units of the population

(4) any five units of the population

90. If from a finite population of size 200, a random sample of size 20 is selected, then the finite population correction factor will be

(1) 0·90 (2) 0·10 (3) 0·005 (4) 0·995

91. Number of replications in an experiment is based on

(1) the precision required

(2) experimental material available

(3) heterogeneity of experimental material

(4) All of the above

92. If the variances of sample mean in simple random sampling *without and with* replacement are respectively V_{wor} and V_{wr}, and $e = \left(\frac{V_{wor}}{V_{wr}}\right)$, then the value of e is

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

93. Components of time series are

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

94. Local control is completely absent in

(1) completely randomized design (2) randomized block design

(3) Latin square design (4) All of the above

95. The number of all possible interactions in 2^3-factorial experiment is

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

96. The maximum possible number of orthogonal contrasts among four treatments is

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

97. With the help of contrasts, one can estimate the

(1) linear effect (2) quadratic effect

(3) cubic effect (4) All of the above

98. In Latin square design, the number of treatments should be at least

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

99. The ratio of the number of replications required in completely randomized block design (CRBD) and randomized block design (RBD) for the same amount of information is

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

100. If the demand function is $p = 4 - 5x^2$, for what value of x the elasticity of demand will be unitary?

(1) $\frac{2}{\sqrt{15}}$ (2) $\frac{1}{\sqrt{15}}$ (3) $\frac{2}{\sqrt{14}}$ (4) 2

101. In a randomized block design with 4 blocks and 5 treatments having one missing value, the error degrees of freedom will be

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

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

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

103. If different effects are confounded in different blocks, it is said to be

(1) balanced confounding (2) conservative confounding

(3) complete confounding (4) partial confounding

104. For a salesman who has to visit n cities, following will be the ways of his tour plan

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

105. The solution to a transportation problem with m-rows (supplies) and n-columns (destinations) is feasible if number of positive allocations will be

(1) $(m+n)$ (2) $m \times n$ (3) $(m+n-1)$ (4) $(m+n+1)$

106. A feasible solution to a linear programming problem

(1) must satisfy all the constraints of the problems simultaneously

(2) need not satisfy all of the constraints, only some of them

(3) must be a corner point of the feasible region

(4) must optimize the value of the objective function

107. The geometric mean of Laspeyres' and Paasche's price indices is known as

(1) Walsh price index (2) Drobish-Bowley price index

(3) Fisher's price index (4) Kelly's price index

108. Which index satisfies factor reversal test?

(1) Paasche's index (2) Laspeyres' index

(3) Fisher's ideal index (4) Walsh price index

109. Time reversal test is satisfied when

(1) $P_{01} \times P_{10} = 0$ (2) $P_{01} \times P_{10} = 1$

(3) $P_{01} \times P_{10} > 1$ (4) $P_{01} \times P_{10} < 1$

110. Drobish-Bowley index number was invented in the year

(1) 1801 (2) 1871 (3) 1901 (4) 1920

111. In a p-chart, if LCL = 0·04, UCL = 0·76; then the sample size is

(1) 17 (2) 18 (3) 15 (4) 14

112. If LCL = 4 and UCL = 28 be for a number of defects chart, then the CL is

(1) 9 (2) 16 (3) 20 (4) 25

113. Operating characteristic (OC) function $L(\theta)$ is defined as

(1) P (Reject the lot/θ) (2) $1 - P$ (Accept the lot/θ)

(3) P (Accept the lot/θ) (4) None of these

114. Control charts for the number of defects are based on the distribution

(1) hypergeometric (2) geometric

(3) binomial (4) Poisson

115. A mixed strategy game can be solved by

(1) algebraic method (2) matrix method

(3) graphical method (4) All of these

116. The total of 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) 2680 (2) 2230 (3) 892 (4) 446

117. If l_x is the number of persons living at the age x and L_x the number of persons living in the mid of x and $(x+1)$ years, then the relation between l_x and L_x is

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

(2) $L_x = \frac{x}{2} + l_x$

(3) $L_x = l_{x+\frac{1}{2}}$

(4) $L_x = \sqrt{l_x\, l_{x+1}}$

118. The death rate of women due to delivery of children is known as

(1) foetal death rate

(2) maternal mortality rate

(3) infant mortality rate

(4) neonatal mortality rate

119. Age specific fertility curve is

(1) highly negatively skewed

(2) negatively skewed

(3) positively skewed

(4) highly positively skewed

120. The rate at which the population is depleted through deaths over the course of the period is called

(1) crude death rate

(2) specific death rate

(3) standardized death rate

(4) All of the above

121. A human population will have a tendency to increase in size if net reproduction rate is

(1) greater than one

(2) less than one

(3) equal to one

(4) zero

122. 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 these

123. The probability of type II error is

(1) alpha (2) beta (3) P-value (4) $1-\beta$

124. The differences are said to be significant if

(1) H_0 is accepted (2) H_1 is accepted

(3) H_1 is rejected (4) H_0 is rejected

where symbols have their usual meanings.

125. To test the randomness of a sample, the following test is used

(1) Sign test (2) Rank test (3) Run test (4) Median test

126. Which statement is not true for P (type I error)?

(1) Size of test (2) Power of the test

(3) Level of significance (4) Size of the critical region

127. If $x \geq 1$, is the critical region for testing $H_0 : \theta = 2$ against the alternative $H_1 : \theta = 1$, on the basis of the single observation from the population, $f(x, \theta) = \theta \exp(-\theta x)$, $0 \leq x < \infty$, then the value of size of type II error is

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

128. If λ is the likelihood ratio test statistic, then the asymptotic distribution of which one of the following statistics is chi-square distribution?

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

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

130. Let $X_1, X_2, \cdots, X_n$ be a random sample of size n drawn on X which takes the values 1 or 'zero' with respective probabilities θ and $(1-\theta)$. Then an unbiased estimator for θ^2 is

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

where $T = \sum_{i=1}^{n} X_i$

131. If, of the two consistent estimators T_1, T_2 of a certain parameter θ, we have

$$V(T_1) < V(T_2), \text{ for all } n$$

then

(1) T_1 is more efficient than T_2 (2) T_1 is less efficient than T_2

(3) T_1 and T_2 are equally efficient (4) All of the above

132. For the following probability density function

$$f(x;\theta) = [\pi\{1+(x-\theta)^2\}]^{-1}; \begin{matrix} -\infty < x < \infty, \\ -\infty < \theta < \infty, \end{matrix}$$

The Cramer-Rao lower bound of the variance of an unbiased estimator of θ is

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

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

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

134. Let B denote the number of boys in a family with five children. If p denotes the probability that a boy is there in a family, find the least value of p such that $P(B=0) > P(B=1)$

(1) $p=0$ (2) $p=\frac{1}{6}$ (3) $p>\frac{1}{6}$ (4) $p<\frac{1}{6}$

135. If X and Y are two independent binomial variates with parameters $n_1 = 6$, $p=\frac{1}{2}$ and $n_2 = 4$, $p=\frac{1}{2}$ respectively, then the value of $P(X+Y \geq 3)$ is

(1) 0·945 (2) 0·055 (3) 0·455 (4) 0·895

136. In a binomial distribution consisting of 5 independent trails, probabilities of 1 and 2 successes are 0·4096 and 0·2048 respectively, then the parameter p of the distribution is

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

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

(1) F-test (2) t-test (3) z-test (4) chi-square test

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

(1) Poisson (2) binomial (3) symmetrical (4) geometric

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

(1) $\mu \pm 0 \cdot 5\sigma$ (2) $\mu \pm \sigma$ (3) $\mu \pm 2\sigma$ (4) $\mu \pm 3\sigma$

140. Poisson distribution is

(1) platykurtic (2) mesokurtic (3) leptokurtic (4) None of these

141. The Neyman-Pearson lemma provides the most powerful test for the following pair of hypotheses

(1) (simple, composite) (2) (simple, simple)

(3) (composite, composite) (4) (composite, simple)

142. The distribution whose variance is twice its mean

(1) binomial (2) Poisson (3) chi-square (4) F

143. 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) 5 (2) 4 (3) 3 (4) 2

144. 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) $(20 \pm 1 \cdot 47)$ (2) $(20 \pm 1 \cdot 23)$ (3) $(20 \pm 3 \cdot 69)$ (4) $(20 \pm 0 \cdot 92)$

145. Which of these distributions has a pair of degrees of freedom?

(1) Normal (2) Chi-square (3) Binomial (4) None of these

146. If in a distribution, first quartile is 54·52 and third quartile is 78·86, then the median will be

(1) 12·17 (2) 66·69 (3) 70·69 (4) 133·38

147. If the joint distribution of the variables X and Y is BVN$(0, 0, 1, 1, \rho)$, the correlation coefficient between X^2 and Y^2 is equal to

(1) 1 (2) -1 (3) ρ^2 (4) 0

148. A random variable X has mean 3 and variance 2, then the upper bound for $P\{|X-3| \geq 2\}$ is

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

149. A lot of size N having fraction defective p is to be inspected by a single sampling plan of size n and operating characteristic function P_a. The expression for the Average Total Inspection (ATI) of the plan is

(1) $n-(N-n)P_a$ (2) $n(1-P_a)+NP_a$

(3) $(N-1)P_a+nP_a$ (4) $nP_a+N(1-P_a)$

150. To assess the independence of sickness in two different categories of persons, we generally use

(1) unpaired t-test (2) analysis of variance

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

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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।