TEST BOOKLET

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Test Booklet Series

B

Serial No. 918122

BAC-58

STATISTICS

Time Allowed : 2 Hours **Maximum Marks : 300**

INSTRUCTIONS TO CANDIDATE

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET DOES NOT HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
2. ENCODE YOUR OPTIONAL SUBJECT CODE AS MENTIONED ON THE BODY OF YOUR ADMISSION CERTIFICATE AND ADVERTISEMENT AT APPROPRIATE PLACES ON THE ANSWER SHEET.
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4. You have to enter your Roll No. on the Test Booklet in the Box provided along side. DO NOT write anything else on the Test Booklet.
5. This Test Booklet contains 100 items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose **ONLY ONE** response for each item.
6. You have to mark all your responses **ONLY** on the separate Answer Sheet provided by using HB pencil. See instruction in the Answer Sheet.
7. All items carry equal marks. All items are compulsory. Your total marks will depend only on the number of correct responses marked by you in the Answer Sheet. For each question for which a wrong answer is given by you, **one fifth (0.20) of the marks assigned to that question will be deducted as penalty.**
8. Before you proceed to mark in the Answer Sheet the responses to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your **Admission Certificate.**
9. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator the Answer Sheet, the Test Booklet issued to you.

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1. Following is not the method of collecting primary data :

(a) Direct Personal Interview

(b) Indirect oral interview

(c) Using the schedule

(d) Using Government Publications

2. Pie diagram is

(a) One dimensional diagram

(b) Two dimensional diagram

(c) Three dimensional diagram

(d) Pictogram

3. If the frequencies of variable values 0, 1, 2,......., n are the terms of the binomial series $(q + p)^n$, $p + q = 1$ respectively, then the arithmetic mean is

(a) n (b) np

(c) npq (d) cannot find

4. In any discrete distribution the relation between Standard Deviation (SD) and Mean Deviation (MD) from mean is

(a) SD < MD from mean

(b) SD ≤ MD from mean

(c) SD ≮ MD from mean

(d) SD = MD from mean

5. If each of a series is divided by 5, its coefficient of Variation is reduced by

(a) 0% (b) 5%

(c) 10% (d) 20%

6. If one regression coefficient is greater than one, then second one must be

(a) greater than 1 (b) equal to 1

(c) less than 1 (d) no change

7. The idea of product moment correlation was given by

(a) R.A. Fisher (b) Sir Francis Galton

(c) Karl Pearson (d) Spearman

8. If 'r' is the simple correlation coefficient, then $\sqrt{1 - r^2}$ is termed as

(a) Coefficient of determination

(b) Coefficient of non-determination

(c) Coefficient of alienation

(d) Coefficient of regression

9. Correlation between X_1 on one side and X_2, X_3 on the other side is called

(a) Partial correlation

(b) Multiple correlation

(c) Ordinary correlation

(d) Association

10. If $X_3 = aX_1 + bX_2$, then

(a) $r_{12.3} = r_{13.2} = r_{23.1}$

(b) $r_{12.3} = r_{13.2} = r_{23.1} = 1$

(c) $r_{12.3} = r_{13.2} = r_{23.1} = -1$

(d) $r_{12.3}$, $r_{13.2}$ & $r_{23.1}$ are numerically equal to 1

11. If the correlation coefficient r = 0, the angle between the two regression lines is

(a) 0° (b) 90°

(c) 180° (d) 30°

12. Limits of the rank correlation coefficient are

(a) 0 to 1 (b) –1 to 0

(c) $-\infty$ to ∞ (d) –1 to 1

13. The approximate measure of curvilinear relationship between the two variables is

(a) Correlation coefficient

(b) Regression coefficient

(c) Correlation ratio

(d) None of the above

14. Estimate and estimator are

(a) synonyms (b) different

(c) related to population (d) none of the above

15. Standard error of the Statistic is

(a) S.D of the given distribution

(b) S.D of the sampling distribution of a Statistic

(c) S.D of the normal distribution

(d) None of the above

16. The relations between the mean and variance of χ^2 with degrees of freedom 'n' is

(a) 2 mean = variance

(b) Mean = variance

(c) Mean = 2 variance

(d) Mean = n times variance

17. If X_1 and X_2 are independent χ^2 – Variates with n_1 and n_2 degrees of freedom respectively, then the distribution of the variate $U = \frac{X_1}{X_1 + X_2}$ is

(a) χ^2 with $\frac{n_1 - n_2}{2}$ d.f

(b) χ^2 with $n_1 + n_2$ d.f

(c) $\beta_I\left(\frac{n_1}{2}, \frac{n_2}{2}\right)$

(d) $\beta_{II}\left(\frac{n_1}{2}, \frac{n_2}{2}\right)$

18. The variance of Fisher's Z-distribution with d.f v_1 and v_2 is

(a) $\frac{1}{2}\left(\frac{1}{v_1}+\frac{1}{v_2}\right)$

(b) $\frac{1}{2}\left(\frac{1}{v_1}-\frac{1}{v_2}\right)$

(c) $\frac{1}{2}\left(\frac{1}{v_1^2}-\frac{1}{v_2^2}\right)$

(d) $\frac{1}{2}\left(\frac{1}{v_1}+\frac{1}{v_2}+\frac{1}{v_1^2}+\frac{1}{v_2^2}\right)$

19. With usual notation, when v_1 and v_2, the degrees of freedom of Z-distribution are large, the Z-distribution tends to

(a) Normal with mean $\frac{1}{2}\left(\frac{1}{v_2}-\frac{1}{v_1}\right)$

(b) Normal with mean $\frac{1}{2}\left(\frac{1}{v_2}+\frac{1}{v_1}\right)$

(c) F-distribution

(d) χ^2 distribution

20. Student t-distribution was given by

(a) G.W. Snedecor (b) R.A. Fisher

(c) W.S. Gosset (d) Karl Pearson

21. The mean deviation about mean for t-distribution with n d.f. is

(a) $\dfrac{\sqrt{n}\,\Gamma\left(\frac{n-1}{2}\right)}{\sqrt{\pi}\,\Gamma\left(\frac{n}{2}\right)}$ (b) $\dfrac{\sqrt{\pi}\,\Gamma\left(\frac{n-1}{2}\right)}{\sqrt{n}\,\Gamma\left(\frac{n}{2}\right)}$

(c) $\dfrac{\sqrt{n}\,\Gamma\left(\frac{n+1}{2}\right)}{\sqrt{\pi}\,\Gamma\left(\frac{n}{2}\right)}$ (d) $\dfrac{\sqrt{n}\,\Gamma\left(\frac{n+1}{2}\right)}{\sqrt{\pi}\,\Gamma\left(\frac{n-1}{2}\right)}$

22. If X and Y are two independent chi-square variates with v_1 and v_2 d.f respectively, then F-statistics is defined by

(a) $\frac{X}{Y}$

(b) $\frac{\frac{X}{v_1}}{\frac{Y}{v_2}}$

(c) $\frac{\frac{X^2}{v_1}}{\frac{Y^2}{v_2}}$

(d) None of the above

23. F-distribution is applied for

(a) testing the equality of two population variances

(b) for testing the equality of two and more population means

(c) for testing the equality of several regression coefficients

(d) all the above

24. With $v_1 = 1$, the F-distribution implies

(a) χ^2 – distribution with v_2 d.f

(b) χ^2 – distribution with $(1 + v_2)$ d.f

(c) t-distribution with v_2 d.f

(d) t-distribution with $(v_2 - 1)$ d.f

25. If $X_1, X_2, \ldots\ldots, X_n$ is a random sample from a population $N(\mu, \sigma^2)$, the sufficient statistic for σ^2 is

(a) ΣX_i

(b) ΣX_i^2

(c) $\Sigma(X_i - \mu)^2$

(d) none of the above

26. Bias of an estimator can be

(a) positive

(b) negative

(c) either positive or negative

(d) always zero

27. Cramer – Rao inequality is valid in case of

(a) continuous variables (b) discrete variables

(c) both (a) and (b) (d) neither (a) nor (b)

28. Rao-Blackwell theorem enables us to obtain minimum variance unbiased estimator through

(a) unbiased estimators (b) complete statistics

(c) efficient statistics (d) sufficient statistics

29. If t is a consistent estimator of θ, then

(a) t is also a consistent estimator of θ^2

(b) t^2 is also a consistent estimator of θ

(c) t^2 is also a consistent estimator of θ^2

(d) none of the above

30. The credit of inventing the method of moments for estimating the parameters goes to

(a) R. A. Fisher (b) J. Neyman

(c) Laplace (d) Karl Pearson

31. Minimum chi–square estimators are

(a) consistent (b) asymptotically normal

(c) efficient (d) all the above

32. If $X_1, X_2, ..., X_n$ is a random sample from a population with p.d.f.

$$f(x, \theta) = \frac{1}{\theta\sqrt{2\pi}} e^{-x^2/2\theta^2},$$

the maximum likelihood estimator for θ is

(a) $\frac{\Sigma x_i}{n}$ (b) $\frac{\Sigma x_i^2}{n}$

(c) $\sqrt{\Sigma x_i^2} / n$ (d) $\sqrt{\Sigma x_i^2 / n}$

33. Least square theory was propounded by whom and in which year ?

(a) Gauss in 1809 (b) Markov in 1900

(c) Fisher in 1920 (d) None of the above

34. Efficiency of sample mean as compared to median as an estimate of the mean of a normal population is

(a) 64% (b) 157%

(c) 317% (d) 31.5%

35. The diameter of cylindrical rods is assumed to be normally distributed with a variance of 0.04 cm. A sample of 25 rods has a mean diameter of 4.5 cms. 95% confidence limits for population mean are

(a) 4.5 ± 0.004 (b) 4.5 ± 0.0016

(c) 4.5 ± 0.078 (d) 4.5 ± 0.2

36. If the density function of a variable X is

$f(x, \theta) = \theta\, e^{-\theta x}$ for $0 < x < \infty$,

95% central confidence limits for large sample n are

(a) $\left(1 \pm \frac{1.96}{\sqrt{n}}\right)\bar{x}$ (b) $\left(1 \pm \frac{1.96\,\bar{x}}{\sqrt{n}}\right)/\bar{x}$

(c) $\left(1 \pm \frac{1.96}{\sqrt{n}}\right)/\bar{x}$ (d) none of the above

37. Formula for 95% confidence limits for the variance of population $N(\mu, \sigma^2)$ when μ is unknown is given by

(a) $\frac{ns^2}{\chi^2_{(n-1),(0.025)}} \leq \sigma^2 \leq \frac{ns^2}{\chi^2_{(n-1),(0.975)}}$

(b) $\frac{ns^2}{\chi^2_{0.025}} \leq \sigma^2 \leq \frac{ns^2}{\chi^2_{0.975}}$

(c) $\frac{(n-1)s^2}{\chi^2_{0.025}} \leq \sigma^2 \leq \frac{(n-1)\,s^2}{\chi^2_{0.975}}$

(d) $\frac{ns^2}{\chi^2_{n,\,0.025}} \leq \sigma^2 \leq \frac{ns^2}{\chi^2_{n,\,0.975}}$

38. The idea of testing of hypothesis was first set forth by

(a) R. A. Fisher
(b) J. Neyman
(c) E. L. Lehman
(d) A. Wald

39. Area of the critical region depends on

(a) size of type I error
(b) size of type II error
(c) value of the statistic
(d) number of observations

40. Neyman-Pearson lemma provides

(a) an unbiased test
(b) a most powerful test
(c) an admissible test
(d) minimax test

41. In sequential probability ratio test, the sample size is

(a) fixed
(b) fixed but small
(c) fixed but large
(d) a random variable

42. An exact test for testing the independence of attributes in a contingency table of order (2×2) was given by

(a) Karl Pearson
(b) Pascal
(c) Demoivre
(d) R. A. Fisher

43. The χ^2 – statistic to test $H_0 : \sigma^2 = \sigma_0^2$ is based on a sample of size n has degrees of freedom equal to

(a) $n - 1$
(b) n
(c) $n + 1$
(d) none of the above

44. If in Wilcoxon's signed rank test, the sample size is large, the statistic T^+ is distributed with mean

(a) $\frac{n(n+1)}{4}$
(b) $\frac{n(n+1)}{2}$
(c) $\frac{n(2n+1)}{4}$
(d) $\frac{n(n-1)}{4}$

45. If there are 10 symbols of two types, equal in number, the maximum possible number of runs is

(a) 8 (b) 9

(c) 10 (d) 5

46. If the sample size in Wald-Wolfowitz runs test is large, the variate R is distributed with variance

(a) $\frac{2\,mn\,(2mn - m - n)}{(m + n)\,(m + n - 1)}$

(b) $\frac{2\,mn\,(2mn - m - n)}{(m + n)^2\,(m + n - 1)}$

(c) $\frac{mn\,(2mn - m - n)}{(m + n)^2\,(m + n - 1)}$

(d) $\frac{2\,mn\,(mn - m - n)}{(m + n)\,(m + n - 1)}$

47. Reduction in the size of a test results into

(a) decrease in its power

(b) increase in its power

(c) no change in its power

(d) all the above

48. If two samples of size 9 and 11 have means 6.8 and 8.8 and variances 36 and 25 respectively from two populations $N(\mu_1,\sigma^2)$ and $N(\mu_2,\sigma^2)$ the absolute value of the statistic t for testing $H_0 : \mu_1 = \mu_2$ is

(a) 0.148 (b) 1.83

(c) 0.81 (d) 0.91

49. Assume that the daily sales of petrol follows exponential distribution. The hypothesis H_0 that the sales of petrol is 1000 litres per day is tested against H_1 that it is 1500 litres per day. If the sales on a day is 1200 litres or more, H_0 is rejected, the size of type I error is

(a) $1 - e^{-1.2}$ (b) $e^{1.2}$

(c) $e^{-1.2}$ (d) none of the above

50. In determining the average life length of bulbs produced by a company, one has the following Assertion and a Reason.

Assertion (A) : A complete enumeration survey is to be performed.

Reason (R) : Average life length should be measured accurately as far as possible.

Then choose the correct option from the following :

(a) Both (A) and (R) are true and (R) is the correct explanation for (A).

(b) Both (A) and (R) are true, but (R) is not the correct explanation.

(c) (A) is true, but (R) is false.

(d) (A) is false, but (R) is true.

51. From a population containing 45 units, a simple random sample without replacement of five units are to be selected. The two digit random numbers to be used for the selection are the following :

40, 52, 85, 18, 38, 77, 98, 48, 83, 56, 92, 31, 40.

Then the sampling units are

(a) 18, 38, 77, 98, 48

(b) 40, 52, 85, 18, 38

(c) 40, 7, 18, 38, 32

(d) 40, 18, 38, 31, 40

52. Suppose a population consists of only 5 units with the values on a characteristic measured on them given by : 2.1, 3.6, 4.2, 2.8, 2.3. Then what is the mean of all possible means of random samples (without replacement) of size two drawn from the above population ?

(a) 3.00

(b) 2.85

(c) 3.15

(d) 2.20

53. In simple random sampling with replacement of three units from a population of N units, the probability that the sample contains all different units is equal to

(a) $\frac{3!}{N^3}$

(b) $\frac{(N-1)(N-2)}{N^2}$

(c) $\frac{1}{N(N-1)(N-2)}$

(d) $\frac{6(N-1)(N-2)}{N^3}$

54. Suppose one wish to estimate the population mean $\bar{Y}$ such that the probability of large deviation of the sample mean $\bar{y}$ with $\bar{Y}$ exceeds d is equal to 0.05. Then the sample size required in simple random sampling is approximately equal to (for S^2 to denote the mean square errors of the population).

(a) $\frac{0.05}{0.95}\left(\frac{1.96\,S}{d}\right)^2$

(b) $\frac{0.95}{0.05}\left(\frac{1.96\,S}{d}\right)^2$

(c) $\left(\frac{1.96\,S}{d}\right)^2 \Big/ \left\{1+\frac{1}{N}\left(\frac{1.96\,S}{d}\right)^2\right\}$

(d) $\left(\frac{1.64\,S}{d}\right)^2 \Big/ \left\{1+\frac{1}{N}\left(\frac{1.64\,S}{d}\right)^2\right\}$

55. In simple random sampling, the variance of the sample proportion p of a characteristic with a corresponding population proportion P is equal to

(a) $\frac{P(1-P)}{n}$

(b) $\frac{P(1-P)n}{N}$

(c) $\frac{P(1-P)}{N}$

(d) $\frac{P(1-P)}{n} \cdot \frac{N-n}{N-1}$

56. A population is divided into four stratas with strata size and strata variance for each strata given as below.

Strata No.	Strata Size	Strata Variance
1	400	12.25
2	300	4.00
3	100	16.00
4	200	9.00

Then with the above information, for a stratified sample of size 90, the stratum sample size allocation are

(a) 42, 18, 12, 18

(b) 36, 27, 9, 18

(c) 25, 15, 30, 20

(d) 23, 23, 22, 22

57. If V_{opt}, V_{prop} and V_{ran} are the variances of the mean due to stratified sampling under optimum allocation, proportional allocation and random allocation respectively, then which of the following is correct ?

(a) $V_{opt} \leq V_{ran} \leq V_{prop}$

(b) $V_{opt} \leq V_{prop} \leq V_{ran}$

(c) $V_{ran} \leq V_{opt} \leq V_{prop}$

(d) $V_{ran} \leq V_{prop} \leq V_{opt}$

58. If observations y_i, x_i are measured on variables Y and X on each unit of a simple random sample of size n, then for $f = \frac{n}{N}$, $r = \overline{Y} / \overline{X}$ and large n, Var $(\overline{y}/\overline{x})$ is approximately equal to

(a) $\frac{1-f}{n\overline{X}^2}$

(b) $\sum_{i=1}^{N} \frac{(y_i - r x_i)^2}{N-1}$

(c) $\sum_{i=1}^{N} \frac{(y_i - r x_i)^2}{n\overline{X}^2}$

(d) $\frac{1-f}{n\overline{X}^2} \sum_{i=1}^{N} \frac{(y_i - r x_i)^2}{N-1}$

59. Under simple random sampling, if $f = \frac{n}{N}$ is the sampling fraction, then with usual notation, the variance of the ratio estimator $\hat{Y}_R$ of the population mean Y is equal to

(a) $\sum_{i=1}^{N} \frac{(y_i - R x_i)^2}{N}$

(b) $\sum_{i=1}^{n} \frac{(y_i - R x_i)^2}{n}$

(c) $\left\{\sum_{i=1}^{n} (y_i - Rx_i)^2\right\} \frac{1-f}{n}$

(d) $\frac{1-f}{n} \sum_{i=1}^{N} \frac{(y_i - R x_i)^2}{N-1}$

60. In systematic sampling consider the following statements :

A : The sample mean of a linear systematic sample is always an unbiased estimator of population mean.

B : The sample mean of a circular systematic sample is an unbiased estimator of the population mean.

Then which of the following is correct ?

(a) Both A and B
(b) Neither A nor B
(c) Only A
(d) Only B

61. Given $\overline{Y}_{sy}$, the systematic sample mean with k the sampling interval, P_c the intraclass correlation between pairs of units within a sample. Now consider the following statements :

A : Systematic sampling is more efficient than srs if $P_c < \frac{-1}{Kn-1}$.

B : Systematic sampling is less efficient than srs if $P_c = \frac{-1}{Kn-1}$

C : Systematic sampling is as efficient as srs if $P_c > \frac{-1}{Kn-1}$

Then which of the following is correct ?

(a) All A, B and C are true.
(b) A is true but not B and C.
(c) All A, B and C are false.
(d) A and B are true but not C.

62. In which of the following case cluster sampling is not preferred ?

(a) No reliable list of elements in the population is available.
(b) It is prohibitively expensive to construct the list of elements in the population.
(c) Economic considerations compels one to use larger cluster.
(d) The list of elements is available, but there is large variability among the units of the population.

63. Which error of the following is called a sampling error ?

(a) Failure to measure some of the units in the survey.
(b) Errors committed on the measurement of a unit.
(c) Error occur in an estimate when only n $(n < N)$ of the units are measured instead of the complete population of N units.
(d) Errors occur in editing, coding and tabulating the results.

64. In the one way analysis of variance model given by

$$y_{ij} = a + \alpha_i + b X_{ij} + e_{ij}, \quad j = 1, 2, .., n_{ij} \quad i = 1, ..., r$$

$$\text{if } E_{YY} = \sum_{ij} Y_{ij}^2 - \sum_i \frac{Y_i^2}{n_i}, E_{XX} = \sum_{ij} X_{ij}^2 - \sum_i \frac{X_i^2}{n_i} \text{ and}$$

$E_{XY} = \sum_{ij} X_{ij} Y_{ij} - \sum_i \frac{X_i Y_i}{n_i}$, then to test H_0: b = 0, the statistic to be used is (use $n = n_1 + n_2 + ... + n_r$)

(a) E_{XY^2} / E_{XX}

(b) $E_{YY} - \frac{E_{XY^2}}{E_{XX}}$

(c) $\frac{E_{XY^2}}{E_{XX}} \div \frac{1}{n-r}\left(E_{YY} - \frac{E_{XY^2}}{E_{XX}}\right)$

(d) $\frac{E_{XY^2}}{E_{XX}} \div \left\{\frac{1}{n-r-1}\left(E_{YY} - \frac{E_{XY^2}}{E_{XX}}\right)\right\}$

65. The following is the layout and yields of an RBD with four blocks and 3 treatments of which one observation is missing (values given in parenthesis are yields)

Blocks	**Treatments**		
1	T_3 (2)	T_2 (3)	T_1 (4)
2	T_1 (6)	T_3 (3)	T_2 (4)
3	T_2 (4)	T_3 (–)	T_1 7
4.	T_1 (2)	T_2 (2)	T_3 (1)

Then the estimated value of the missing observation is

(a) 5.5 (b) 2

(c) 38/11 (d) 4

66. The following is the arrangement of five treatments (1, 2, 3, 4, 5) into 10 blocks :

Block No.	Treatments		
1	1	2	3
2	1	2	4
3	1	2	5
4	1	3	4
5	1	3	5
6	1	4	5
7	2	3	4
8	2	3	5
9	2	4	5
10	3	4	5

Then with usual notation the parameters (k, b, v, r, λ) of this design (BI BD) are

(a) (10, 3, 3, 5, 3) (b) (3, 10, 5, 6, 3)

(c) (3, 5, 3, 6, 2) (d) (3, 10, 5, 6, 2)

67. The standard error of difference between a pair of treatment means in a BIBD is equal to

(a) $\sigma\sqrt{\frac{2}{r}}$ (b) $\sigma\sqrt{\frac{2}{b}}$

(c) $\sigma\sqrt{\frac{2k}{\lambda V}}$ (d) $\sigma\sqrt{\frac{2r}{\lambda V}}$

68. In confounding in 2^4 – factorial experiment, the intrablock subgroup of the confounding system is {(1), bc, abd, acd}. Then the other blocks are

(a) {a, bc, d, abcd}, {b, ac, abd, cd}, {c, ab, acd, bd}

(b) {a, abc, bd, cd}, {b, c, ad, abcd}, {ab, ac, d, bcd}

(c) {a, bc, b, ac}, {abd, cd, c, ab}, {d, abcd, acd, bd}

(d) {a, b, ac, bc}, {abd, cd, d, abcd}, {c, ab, acd, bd}

69. If the principal block of the confounding system is as given in question Number 68, then the effects confounded are

(a) ABC, BCD, AD (b) AB, CD, ABCD

(c) ACD, BC, ABD (d) AC, BD, ABCD

70. If the principal block of the confounding system is as given in question No. 68 and if there are three repetitions of the same confounded arrangement, then the degrees of freedom for the error sum of squares in the ANOVA is equal to

(a) 36
(b) 32
(c) 30
(d) 24

71. In a split plot design with 3 main plot treatments, 4 sub plot treatments and 3 blocks, the sub plot error sum of squares has a degrees of freedom equal to

(a) 22
(b) 18
(c) 4
(d) 22

72. The error degrees of freedom in the Analysis of variance of the design given in question No. 66 is equal to

(a) 36
(b) 16
(c) 9
(d) 13

73. If the blocks of a 2^3- experiment are {(1), a, b, c, abc},

{(1), a, bc, abc}, {(1), b, ac, abc}, {(1), ab, ac, bc},

{a, b, ac, bc}, {b, ab, c, ac}, {a, ab, c, bc},

{a, b, c, abc} then the partially confounded effects are

(a) A, C, AC, ABC

(b) AB, C, ABC, BC

(c) AB, BC, AC, ABC

(d) AB, C, AC, BC

74. If the arrangement of treatments of a 2^3 – experiment in eight blocks are as given in question No. 73, then the error degrees of freedom in the analysis of the variance is given by

(a) 17
(b) 21
(c) 18
(d) 20

75. An experiment consists of flipping a coin and then flipping it a second time if a head occurs. If a tail occurs on the first flip, then a six faced die is tossed once. Then the total number of outcomes in the sample space is

(a) 2 (b) 6

(c) 8 (d) 12

76. From past experience it is known that an investor will invest in security A with a probability of 0.6, will invest in security B with a probability 0.3 and will invest in both A and B with a probability of 0.2. Then the probability that a customer will invest neither in A nor in B is

(a) 0.3 (b) 0.28

(c) 0.7 (d) 0.18

77. The probability that a student passes Mathematics is 4/9 and that he passes Physics is 2/5. Assuming that passing in Mathematics and Physics are independent of each other, what is the probability that he passes in Mathematics but fails in Physics ?

(a) 19/45 (b) 8/45

(c) 26/45 (d) 4/15

78. Two urns contain 6 white and 3 black balls and 5 white and 7 black ball respectively. An urn is chosen at random and a ball is drawn. It was found to be white. Then the probability that it was drawn from the first urn is,

(a) $\frac{8}{13}$ (b) $\frac{1}{3}$

(c) $\frac{5}{12}$ (d) $\frac{5}{24}$

79. An aircraft has three engines A, B and C. These engines work independent of each other. The aircraft fails if all the three engines fail. The probabilities of failure are 0.03, 0.02 and 0.05 for engines A, B and C respectively. What is the probability that the aircraft will not fail ?

(a) 0.00003 (b) 0.90

(c) 0.99997 (d) 0.90307

80. Certain discrete random variable X has the following probability mass function (p.m.f.)

x	−3	−2	−1	0	1	2
P(X = x)	1/16	3/16	4/16	3/16	3/16	1/16

Then Var(X) is

(a) 2

(b) $\frac{49}{256}$

(c) $\frac{7}{16}$

(d) $\frac{463}{256}$

81. The life of an electronic component is known to have the following probability density function (p.d.f.)

$$f(x) = 0.2e^{-0.2x}\ x > 0$$

Then Var (X) is

(a) 0.04

(b) 25

(c) 5

(d) 0.02

82. A random variable X has the following probability mass function

$$P(x) = \frac{x}{15} \quad x = 1, 2, 3, 4, 5$$

Then $E(X| x > 1)$ is equal to

(a) 45/14

(b) 3

(c) 45

(d) 15/14

83. A random variable X has the following distribution

$$f(x) = \frac{1}{12}, 0 < x < 12$$

0 otherwise

Then $P(5 < X < 7| x > 4)$

(a) 3/4

(b) 1/4

(c) 2/3

(d) 1/6

84. The probability distribution of a random variable X is given by

$f(x) = C(2x - x^2)\ 0 < x < 5/2$

0 otherwise

Then the value of C is

(a) 25/24 (b) 2/15

(c) 24/25 (d) 3/4

85. The probability distribution of a random variable X is given by

$$f(x) = \frac{1}{4} xe^{-x/2}, \ x > 0$$

Then E(X) is

(a) 2 (b) 1/2

(c) 4 (d) 1/4

86. A random variable X has uniform distribution over (0, 1).

If $P\{ |X - ½| \geq \sqrt{\frac{1}{3}} \} \leq a$ then using Chebychev's inequality the value of 'a' is

(a) 1/4 (b) 2/3

(c) 1/3 (d) 3/4

87. Let (X, Y) have a joint distribution given by $f(x, y) = 2, 0 < x < y < 1$.

Then the conditional distribution of X given Y is

(a) $f(x|y) = 1/y \quad 0 < y < 1$

(b) $f(x|y) = 1/y \quad 0 < x < y$

(c) $f(x|y) = 1/(1 - x) \quad 0 < x < 1$

(d) $f(x|y) = 1/(1 - x) \quad x < y < 1$

88. Among the following statements, which statement is true ?

(a) Every sequence $\{X_n\}$ of random variables obeys SLLN.

(b) Every sequence $\{X_n\}$ of independent random variables obeys SLLN.

(c) Every sequence $\{X_n\}$ of i.i.d random variables with finite mean obeys SLLN.

(d) Every sequence $\{X_n\}$ of independent random variables with uniformly bounded variance obeys SLLN.

89. If X is binomial with parameters n and p = ½, and if P(X = 4) = P (X = 5), then

(a) n = 6 (b) n = 8

(c) n = 10 (d) n = 9

90. A wall measures 40 m by 30 m contains a window of size 15 m by 10 m. The wall is hit by four stones thrown up by a mower. Assuming that each stone hits the wall in a random position independently of other stones, what is the probability that every throw hits the window ?

(a) 1/8 (b) 1/4096

(c) $(7/8)^4$ (d) 1/512

91. Certain event occurs in accordance with Poisson distribution at the rate of 2 per hour. Then the probability that exactly one event will occur in two hours is

(a) $4e^{-4}$ (b) e^{-2}

(c) 0.04 (d) $\frac{e^{-2}}{2}$

92. The moment generating function M.G.F. of a r.v. X is $e^{t^2/2}$. Then which one of the following statements is true ?

(a) Var (X) = 0

(b) X has a Cauchy distribution

(c) E (X) = Var (X)

(d) $E(X^2)$ = Var (X)

93. The characteristic function of a random variable X is $\frac{1}{1+t^2}$. Then X has the following distribution :

(a) Laplace (b) Cauchy

(c) Exponential (d) Uniform

94. A random variable X has uniform distribution over (0, 2). Then the Var(X) is

(a) 1/3 (b) 2/3

(c) 1/12 (d) 1

95. A random variable Y has a normal distribution. Then the distribution of e^Y is

(a) Exponential (b) Laplace

(c) Lognormal (d) Weibul

96. An electronic signal hits at a counter. The signal may register or may miss. The probability that the signal registers in any hit is 0.25. Then the expected number of hits required for the signal to register is

(a) 5 (b) 4

(c) 8 (d) 10

97. If X and Y are Gamma variates, then X/Y is

(a) Gamma variate (b) Beta variate

(c) Cauchy variate (d) Chi-square variate

98. Identify the odd item in the following list :

(a) Exponential distribution

(b) Gamma distribution

(c) Uniform distribution

(d) Normal distribution

99. Let (X, Y) have a bivariate normal distribution. Then which one of the following statements is not true ?

(a) Marginal distributions of X and Y are normal.

(b) Conditional distribution X given Y is normal.

(c) X-Y is normal.

(d) X and Y are independent when $\rho = 1$

100. Head of a row in Tabular presentation is called

(a) Stub (b) Caption

(c) Title (d) Foot note

Space For Rough Work

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