Code No.
R-2119

## Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2023

CSS
STATISTICS, APPLIED STATISTICS AND DATA ANALYTICS

## General Instructions



1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be $(\checkmark)$ 'tick marked' only in the "Response Sheet" provided.
3. Negative marking : $\mathbf{0 . 2 5}$ marks will be deducted for each wrong answer .

Time : 2 Hours
Max. Marks : 100

To be filled in by the Candidate

| Register <br> Number | in Figures |  |  |  |  |  |  |  |  |
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|  | in words |  |  |  |  |  |  |  |  |

$\square$

Choose appropriate answer from the options in the questions.

$$
\text { (100 } \times 1=100 \text { marks })
$$

1. If $X$ and $Y$ are two independent Poisson variates with parameters 3 and 4 respectively. What is the value of $P(Y=3 \mid X+Y=8)$ ?
a) 0.051
b) 0.037
c) 0.151
d) 0.245

2. Which of the following is an example of ordinal variable?
a) Caste
b) Nationality
c) Annual income
d) Credit rating of a bank
3. The equations $2 x+5=5, x+3 y=5, x-2 y=0$ have $\qquad$ number of solutions.
a) zero
b) one
c) two
d) many
4. If $F(x)$ is the distribution function of the random variable $X$, then for $a \leq b$
a) $\quad P(a<X<b)=F(b)-F(b)$
b) $P(a<X<b)=F(b)-F(a)-P(X=a)$
c) $P(a<X<b)=F(b)-F(a)-P(X=b)$
d) $\quad P(a<X<b)=F(b)-F(a)-P(X=a)-P(X=b)$
5. Consider the following statements
I. If $S$ is closed and $\delta$ is admissible, then every risk function is convex
II. If $S$ is closed, then $S$ will not have a limit point
III. If $S$ is closed from below, then $S \notin E_{k}$

Which of the following is correct?
a) Only I is correct
b) Only II is correct
c) Both I and II is correct
d) Both II and III is correct
6. In the analysis of RBD with $b$ blocks and $v$ treatments, the error degrees of freedom are
a) $b(v-1)$
b) $v(b-1)$
c) $(b-1)(v-1)$
d) $(b-v)$
7. Consider the following statements:
I. A complete class of decision rules contains only admissible decision rules
II. A minimal complete class of decision rule contains only admissible decision rules
III. A minimal complete class of decision rule is always complete

Which of the following is correct?
a) Only I is correct
b) Only II is correct
c) Both I and II is correct
d) Both II and III is correct
8. Consider a lot consisting of 10 bulbs is inspected by taking at random 3 bulbs and testing them for defective or non-defective. If the number of defective bulbs in the lot is 4 , what is $\operatorname{Pr}(2$ defective bulbs)?
a) 0.2
b) 0.3
c) 0.4
d) 0.5
9. Variance of Hypergeometric distribution with $N=20, n=5$ and $M=12$ is given by
a) 0.947
b) 1.245
c) 3.276
d) 4.563
10. Let $\left\{X_{n}, Y_{n}\right\}, n=1,2, \ldots$, be a sequence of random variables. Then $\left|X_{n}-Y_{n}\right| \xrightarrow{p} 0$ and $Y_{n} \xrightarrow{L} Y$ implies
a) $X_{n} \xrightarrow{L} X$
b) $\quad X_{n} \xrightarrow{L} Y$
c) $\quad Y_{n} \xrightarrow{L} X$
d) $\quad X_{n} Y_{n} \xrightarrow{L} Y$
11. The UCL and LCL of a basic mean chart is given as 12 and 8 respectively. If variance of the process is given as 16 , then what is the sample size of the process?
a) 36
b) 28
c) 25
d) 18
12. If $X \sim$ Poisson (4) and $Y \sim$ Poisson (3), and $X$ and $Y$ are independent. What is the value of $E[X \mid(X+Y)]$, if $n=10$ ?
a) 3.45
b) 4.32
c) 5.23
d) 5.71
13. The value of $m$ so that the vector $(m, 3,1)$ is a linear combination of the vectors $(3,2,1)$ and $(2,1,0)$ is
a) 1
b) 3
c) 5
d) 7
14. Given the following statements about a one parameter exponential family of distribution
I. It always admits sufficient statistics
II. The moment estimator $\hat{\theta}$ based on sufficient statistics is CAN for $\theta$
III. The asymptotic variance zero every time

Which of the following are correct?
a) Only I and II are correct
b) Only I and III are correct
c) Only II and III are correct
d) All are correct
15. If the mean value function of a renewal process is $m(t)=2 t, t \geq 0$, what is the value of $M(T)$ ?
a) 2
b) $t$
c) $t^{2}$
d) $2 t^{2}$
16. The following statements given is respect of Maximum Likelihood Estimation (MLE)
I. MLE's are always unique
II. MLE's are not necessarily unbiased
III. MLE's satisfies invariance property, provided the transformation is one-toone

Which of the following are correct?
a) Only I and II correct
b) Only I and III are correct
c) Only II and III are correct
d) All are correct
17. Consider the following statements
I. Least square estimators are unbiased for all general linear models
II. Under fairly general conditions, the estimates obtained by method of moments will have asymptotically normal distribution for large $n$
III. The minimum chi-square estimators are not necessarily consistent

Which of the following are correct?
a) Only I and II are correct
b) Only I and III are correct
c) Only II and III are correct
d) All are correct
18. The matrix $\left[\begin{array}{cc}1 & -1 \\ -1 & 1\end{array}\right]$ is
a) Positive definite
b) Negative definite
c) Positive semi definite
d) Negative semi definite
19. Let $N(t)$ be a Poisson process with constant intensity function on $R$. What is the covariance of $N(s)$ and $N(t)$ ?
a) $\lambda s$, if $s<t$
b) $\lambda(t-s)$, if $s<t$
c) $\lambda(s-t)$, if $(t<s)$
d) $\lambda(s+t)$
20. A bag contains 5 black, 6 red and 3 white balls. If a ball is drawn at random, what is the probability that it is not a white ball?
a) $11 / 14$
b) $13 / 14$
c) $38 / 55$
d) $27 / 35$
21. Every sequence $\left\{X_{n}\right\}$ of independent random variables with uniformly bounded variances obeys
a) Borel-Cantelli lemma
b) Cauchy's criterion
c) WLLN
d) $\operatorname{SLLN}$
22. If $V$ be a collection of vectors, then $V$ is said to be subspace, if
a) $\quad V$ is closed under multiplication
b) $\quad V$ is closed under multiplication and addition
c) $\quad V$ is closed under scalar multiplication
d) $\quad V$ is closed under addition and scalar multiplication
23. Let $X$ be a random variable with pgf $P(S)$. Then the pgf of $3 X-1$ is
a) $S P(S)$
b) $S / P(S)$
c) $P(S) / S$
d) $P\left(S^{3}\right) / S$
24. The AQL of a process is the
a) Lowest fraction defective that is acceptable to the customer
b) Lowest fraction defective that is unacceptable to the customer
c) Highest fraction defective that is unacceptable to the customer
d) Highest fraction defective that is acceptable to the customer
25. With the usual notations, find $p$ for a binomial random variable $X$, if $n=6$ and if $9 P(X=1)=P(X=2)$
a) $12 / 15$
b) $18 / 23$
c) $19 / 27$
d) $9 / 14$
26. The quadratic form $6 x_{1}^{2}+3 x_{2}^{2}+14 x_{3}^{2}+4 x_{2} x_{3}+18 x_{1} x_{3}+4 x_{1} x_{2}$ is
a) Negative definite
b) Positive definite
c) Positive semi definite
d) Negative semi definite
27. Let $T$ be CAN for $\theta$ so that $T \sim A N\left(\theta, \sigma_{T}^{2}(\theta) / a_{n}^{2}\right)$ and let $\psi$ be a differentiable function such that $\frac{d \psi}{d \theta}$ is continuous and non vanishing then $\psi(T)$ is CAN for $\psi(\theta)$ with asymptotic variance.
a) $\left(\frac{d \psi}{d \theta}\right)^{2} \sigma_{T}^{2}(\theta)$
b) $\left(\frac{d \psi}{d \theta}\right)^{2} a_{n}^{2} \sigma_{T}^{2}(\theta)$
c) $\left(\frac{d \psi}{d \theta}\right)^{2} \frac{\sigma_{T}^{2}(\theta)}{a_{n}^{2}}$
d) $\left(\frac{d \psi}{d \theta}\right)^{2} \frac{\sigma_{T}^{4}(\theta)}{a_{n}^{4}}$
28. If the percent of trend for a year in a time series is greater than $100 \%$, it indicates that
a) The actual time series value lies below the trend line and the relative cyclical residual is positive
b) The actual time series value lies below the trend line and the relative cyclical residual is negative
c) The actual time series value lies above the trend line and the relative cyclical residual is negative
d) The actual time series value lies above the trend line and the relative cyclical residual is positive
29. If $3,8,5,4$ and 10 are exponential samples with mean $\theta$. The Fisher information function evaluated at $\theta=2$ is
a) 0.50
b) 0.80
c) 1.20
d) 1.25
30. The ratio of number of replication required in CRD and RBD for the same amount of information is
a) $3: 2$
b) $5: 3$
c) $5: 4$
d) $3: 5$
31. The number of monthly breakdowns of computers is a random variable having a Poisson distribution with a mean equal to 1.8. Find the probability that this computer will function for a Month without a breakdown.
a) 0.165
b) 0.265
c) 0.365
d) 0.465
32. If $A=\left[\begin{array}{cc}3 & -7 \\ -4 & 1\end{array}\right]$, then the determinant of $A^{3}+3 A^{2}+12 A$ is
a) -2900
b) -29500
c) -3000
d) -39500
33. The Cramer-Rao lower bound for $\psi(\theta)=e^{-\theta}$ in Poisson distribution with parameter $\theta$ is
a) $\frac{\theta}{n} e^{-2 \theta}$
b) $\frac{n}{\theta} e^{-2 \theta}$
c) $\frac{2 \theta}{n} e^{-2 \theta}$
d) $\frac{\theta^{2}}{n} e^{-2 \theta}$
34. Let $X_{1}, X_{2}, \ldots, X_{n}$ be iid Poisson $(\mu)$. Then the UMVUE of $P(X=0)$ is
a) $\left(1-\frac{1}{\bar{x}}\right)^{n}$
b) $\left(1-\frac{n}{\bar{x}}\right)^{n}$
c) $\left(1-\frac{1}{n}\right)^{\Sigma x}$
d) $\left(1-\frac{1}{n}\right)^{\bar{x}}$
35. If $3,8,5,4$ and 10 are exponential samples with mean $\theta$. Then the score function evaluated at $\theta=4$ is
a) 0.36
b) 0.40
c) 0.56
d) 0.68
36. Consider the following statements:
I. For an estimator to be consistent, the unbiasedness of the estimator is necessary
II. If the variance of an estimator attains the Crammer-Rao lower bound, the estimator is consistent
III. A UMVUE is unique, if it exists

Which of the following are correct?
a) Only I is correct
b) Only II is correct
c) Only III is correct
d) None is correct
37. If $12,18,8,22$ and 15 are random samples from $N\left(\mu, \sigma^{2}\right)$. An unbiased estimator of $\sigma^{2}$ is given by
a) 20
b) 25
c) 29
d) 33
38. Basu's theorem is useful in determining the statistics $V$ which is
a) Independent of sufficient statistic $T$
b) Linear function of $U$ and $T$
c) Monotone in $U$ for fixed $t$
d) None of these
39. The nonparametric test equivalent of a one-way ANOVA is
a) Wilcoxon Signed Rank Test
b) Wilcoson Rank Sum Test
c) Kruskall-Wallis Test
d) Ansari-Bradley Test
40. The summary of two variables are given as follows

$$
\begin{aligned}
& \sum x_{i}=53, \quad \sum x_{i}^{2}=297, \quad \sum y_{i}=277.5, \quad \sum y_{i}^{2}=9941.25, \quad \sum x_{i} y_{i}=1630 \quad \text { and } \\
& n=12
\end{aligned}
$$

What is the value of slope?
a) 2.5
b) 3.6
c) 4.8
d) 6.4
41. If $n=15, \sum x=480, \sum x^{2}$, then the standard deviation of $y=5 x-10$ is
a) 100
b) 96.82
c) 47.56
d) 112.88
42. Let $X_{1}, X_{2}, \ldots$ be iid Poisson $(\lambda)$ random variables. If $S_{n}=\sum_{k=1}^{n} X_{k}$. If $\lambda=1$ and $n=64$, then the value of $P\left\{50<S_{n}<80\right\}$ is approximately
a) 0.7329
b) 0.8321
c) 0.7884
d) 0.9348
43. Consider a discrete classification with $n_{1}, n_{2}, n_{3}, n_{4}$ as the number of observations in each cell such that $\sum_{i=1}^{3} n_{i}=n$. The cell probabilities are respectively given as $\theta^{2}, \theta[1-\theta], \theta(1-\theta)$ and $(1-\theta)^{2}$. What is the MLE of $\theta$ is
a) $\frac{n_{4}}{2 n}$
b) $\frac{2 n_{1}+n_{2}}{n_{1}+n_{3}}$
c) $\frac{2 n_{1}+n_{3}}{n_{1}+n_{2}+n_{4}}$
d) $\frac{2 n_{1}+n_{2}+n_{3}}{2 n}$
44. Let $X$ be a random variable having the probability function $f(x, \theta)=\binom{n}{x} \theta^{x}(1-\theta)^{n-x}, x=0,1,2, \ldots, n$

If $d(x)=\frac{x}{n}$, then the risk function $R(\theta, d)$ under squared error loss function is
a) $\frac{\theta(\theta-1)}{n}$
b) $\frac{\theta(\theta+1)}{n}$
c) $\frac{\theta(1-\theta)}{n}$
d) $\frac{\theta^{2}}{n}$
45. Let $X_{1}, X_{2}, \ldots$ be iid Bernoulli with parameter $(\lambda)$. If apriori it is known that $\lambda \in[1 / 4,3 / 4]$. If $\bar{X} \geq \frac{3}{4}$. What is the MLE of $\lambda$ ?
a) $1 / 4$
b) $1 / 2$
c) $3 / 4$
d) 1
46. An inspection of 10 samples of size 400 each from 10 lots revealed the following defective units $17,15,14,26,9,4,19,12,9,15$. The upper control limit for number of defective is
a) 18.95
b) 21.45
c) 23.32
d) 25.03
47. The measure of Kurtosis of $t$-distribution is
a) $\frac{n-2}{n-3}$
b) $\frac{3(n-2)}{n-4}$
c) $\frac{3(n-2)}{n+4}$
d) $\frac{n+2}{n+4}$
48. If $A=\left[\begin{array}{ccc}2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & x\end{array}\right]$ is an idempotent matrix, then the value of $x$ is
a) -1
b) -3
c) -5
d) 3
49. Let $X_{1}, X_{2}, \ldots X_{n}$ be iid with $f(x)=\theta x^{\theta-1}, 0<x<1, \theta>0$. Then the Cramer-Rao Lower Bound for estimating $\theta$ is
a) $n \theta$
b) $\frac{\theta}{n}$
c) $\frac{\theta^{2}}{n}$
d) $\frac{\theta^{2}}{n^{2}}$
50. If a fair coin is tossed two times and the characteristics of interest $X$ is the number of heads. What is the value of value of $E(2 X-3)$ ?
a) 1
b) -1
c) 2
d) -2
51. Degrees of freedom for Chi-square in case of contingency table of order $(4 \times 3)$ are
a) 12
b) 9
c) 8
d) 6
52. A small sample has been taken from a normally distributed population and the sample mean has been found to be 62. The upper limit of a 95 percent confidence interval for population mean is 81.60 . The population variance is known to be 2,400 . What is the sample size?
a) 24
b) 30
c) 36
d) 64
53. Consider the following results on a correlation study : Regression equations : $6 y=5 x+90$ and $15 x=8 y+130$ and variance of $X=4$. What is the coefficient of correlation between $X$ and $Y$ ?
a) 0.45
b) 0.67
c) 0.78
d) 0.88
54. A magazine claims that $25 \%$ of its readers are college students. Of a random sample of 200 readers, 42 are college students. It is to be tested at a 0.10 level of significance whether the proportion of college students among all the readers of the magazine is not equal to 0.25 . What is the conclusion?
a) The proportion of college students among the readers of the magazine is 0.25
b) The sample data are incorrect
c) The proportion of college students among the readers of the magazine is less than 0.25
d) The proportion of college students among the readers of the magazine is more than 0.25
55. The variance of Hyper geometric distribution with $N=20, n=5$ and $M=12$ is given by
a) 1.34
b) 1.28
c) 1.02
d) 0.95
56. A random sample of 100 articles are taken from a batch of 2000 articles shows that the average diameter of the articles is 0.354 and standard deviation 0.048 . What is the $95 \%$ confidence interval for the average diameter of a batch?
a) $(0.2934,0.4235)$
b) $(0.3448,0.3632)$
c) $(0.3021,0.3824)$
d) $(0.3923,0.4212)$
57. A multiple regression relationship contains two independent variables. The standard error of estimate is 4.8 and error sum of squares is 576 . What is the sample size?
a) 24
b) 25
c) 26
d) 28
58. Given the following joint density function :
$f(x, y)=\lambda^{2} e^{-\lambda y}, 0 \leq x \leq y<\infty$
What is $E(Y \mid X)$ ?
a) $X+1 / \lambda$
b) $x-1 / \lambda$
c) $2 x+\lambda$
d) $2 x-\lambda$
59. Let $X$ has the distribution function
$F(x)=\left\{\begin{array}{l}0, x<0 \\ x / 2,0 \leq x \leq 2 \\ 1, x>2\end{array}\right.$
Let $Y=X^{2}$, then what is the value of $P(X \leq 2 Y)$ ?
a) $1 / 2$
b) $2 / 3$
c) $3 / 4$
d) $4 / 7$
60. The percent of total variation of the dependent variable $Y$ explained by the set of independent variable $X$ is measured by
a) Coefficient of correlation
b) Coefficient of skewness
c) Coefficient of determination
d) Standard error
61. While conducting a one way ANOVA, comparing five treatments with ten observations per treatment, let SST $=42.41$ and $\mathrm{MSE}=6.34$. What is the value of F ?
a) 42.41
b) 6.34
c) 1.67
d) 0.74
62. The algebraic expression for interaction $A B C$ is $2^{3}$ experiment is
a) $1 / 4(a-1)(b+1)(c+1)$
b) $\quad 1 / 4(a-1)(b-1)(c+1)$
c) $1 / 4(a-1)(b-1)(c-1)$
d) None of the above
63. Relative efficiency of LSD over RBD when rows are taken as blocks is
a) $\frac{S_{R}^{2}+(t-1) S_{E}^{2}}{t S_{E}^{2}}$
b) $\frac{S_{C}^{2}+(t-1) S_{E}^{2}}{t s_{E}^{2}}$
c) $\frac{S_{C}^{2}+S_{R}^{2}(t-1) S_{E}^{2}}{t S_{E}^{2}}$
d) None of the above
64. An experiment is replicated more than once
a) to remove experimental error
b) to remove the effect of natural factors creating experimental error
c) to find the estimate of experimental error
d) None of the above
65. Experimental error is due to
a) Experimenter's mistakes
b) Extraneous factors
c) Variation in treatment effects
d) None of the above
66. Which of the following is a contrast?
a) $3 T_{1}+T_{2}-3 T_{3}+T_{4}$
b) $T_{1}+3 T_{2}-3 T_{3}+T_{4}$
c) $-3 T_{1}-T_{2}+T_{3}+3 T_{4}$
d) $T_{1}+T_{2}+T_{3}-T_{4}$
67. The formula for estimating one missing value in a RBD having $b$ blocks and $t$ treatments with usual notations.
a) $\frac{b T^{\prime}+t B^{\prime}-G^{\prime}}{(b-1)(t-1)}$
b) $\frac{b B^{\prime}+b T^{\prime}-G^{\prime}}{(b-1)(t-1)}$
c) $\frac{b B^{\prime}+t T^{\prime}-G^{\prime}}{(b-1)(t-1)}$
d) None of the above
68. While analyzing the data of a $k \times k$ Latin square, the error d.f. in analysis of variance is equal to.
a) $(k-1)(k-2)$
b) $\quad k(k-1)(k-2)$
C) $k^{2}-2$
d) $k^{2}-k-2$
69. If the responses for treatments in a factorial experiment with factors $A$ and $B$ each at two levels from three replications are $(1)=18,(a)=17,(b)=25$ and $(a b)=30$, the sum of squares for the interaction $A B$ is equal to
a) 4
b) 3
c) 6
d) 7
70. The formula for estimating one missing value in a Latin square of order $k$ with usual notations is
a) $\quad\left(R^{\prime}+C^{\prime}+T^{\prime}-G^{\prime}\right) /(k-1)(k-2)$
b) $\quad\left[k\left(R^{\prime}+C^{\prime}+T^{\prime}\right)-2 G^{\prime}\right] /(k-1)(k-2)$
c) $K\left(R^{\prime}+C^{\prime}+T^{\prime}-2 G^{\prime}\right) /\left(k^{2}-1\right)$
d) None of the above
71. Kalman Filter is a method of updating the best estimate of the 'signal' in a T.S.
a) When noise is absent
b) When noise is present
c) When random component is present
d) When cyclic component is present
72. Moving average is also a kind of 'Filtering' when the weights in the filter are chosen in such a way that their sum is
a) Zero
b) Unity
c) Finite
d) Convergent
73. In order to determine the order of an AR process for higher order the autocorrelation function may be
a) a mixture of sine and cosine curve
b) a mixture of exponential and sinusoidal curve
c) a mixture of damped exponential and sinusoidal curve
d) a mixture of damped exponential and sine curve
74. While constructing the 'cost of living index number using the aggregate expenditure method the weights to be assigned to various commodities are provided by the
a) Quantities consumed in the base year
b) Quantities consumed in the current year
c) Quantities consumed in the previous year
d) Quantities consumed in any year
75. The mean height of 10,000 children of age 6 years is 41.26 " and the standard deviation is 2.24 ". Then the odds against the possibility that the mean of a random sample of 100 is greater than $41.7^{\prime \prime}$ is
a) $39: 1$
b) $1: 39$
c) $40: 1$
d) $1: 40$
76. Consider the following joint probability mass function and the statements

| X <br> $\mathrm{Y} \xrightarrow{\downarrow}$ | 1 | 2 | 3 |
| :---: | :---: | :---: | :---: |
| 0 | $1 / 24$ | $1 / 12$ | $1 / 8$ |
| 1 | $1 / 12$ | $1 / 6$ | $1 / 4$ |
| 2 | $1 / 24$ | $1 / 12$ | $1 / 8$ |

I. The variables are $X$ and $Y$ are independent
II. The marginal probability of $X$ and $Y$ are the same.

Which of the following are correct?
a) Only I is correct
b) Only II is correct
c) Both I and II are correct
d) Neither I nor II is correct
77. Consider the following statements
I. If three coins are tossed together then the probability of getting at least three head is $3 / 8$
II. The probability of drawing four aces from a pack of 52 cards is $1 / 52$

Which of the following are correct?
a) Only I is correct
b) Only II is correct
c) Both I and II are correct
d) Neither I nor II is correct
78. The joint pmf of $(X, Y)$ are given by

| X <br> $\mathrm{Y} \xrightarrow{\downarrow}$ | 1 | 2 | 3 |
| :---: | :---: | :---: | :---: |
| 1 | 0.2 | 0.1 | 0.2 |
| 2 | 0.2 | 0.0 | 0.1 |
| 3 | 0.1 | 0.1 | 0.0 |

What is the value of correlation between $X$ and $Y$ ?
a) -0.11
b) -0.23
c) -0.45
d) -0.66
79. The joint pmf of $(X, Y)$ is given by

| $\mathrm{X} \stackrel{\downarrow}{\downarrow}$ |  | 2 | 3 |
| :---: | :---: | :---: | :---: |
| $\mathrm{Y} \xrightarrow{\downarrow}$ |  |  |  |
| 1 | 0.2 | 0.1 | 0.2 |
| 2 | 0.2 | 0.3 | 0.0 |

What is the value of $P(X+Y=4)$ ?
a) 0.3
b) 0.4
c) 0.5
d) 0.6
80. The value of $\sum_{r=0}^{n}\binom{n}{r}^{2}$ is
a) $\binom{2 n}{r}$
b) $\binom{2 n}{n}$
c) $\binom{n}{2 r}$
d) $\binom{n}{r}$
81. Which of the following is the appropriate measure of central tendency for knowing the average score obtained by 11 footballers in a goal shoot competition?
a) Arithmetic mean
b) Median
c) Mode
d) Harmonic mean
82. Suppose $(X, Y)$ is a bivariate random variable where
$Y=\left\{\begin{array}{l}1, \text { with probability } 1 / 8 \\ 2, \text { with probability } 7 / 8\end{array}\right.$
and
$X \left\lvert\, Y=\left\{\begin{array}{l}2 Y, \text { with probability } 3 / 4 \\ 3 Y, \text { with probability } 1 / 4\end{array}\right.\right.$
What is the value of $E(X \mid Y=1)$ ?
a) $3 / 4$
b) $5 / 7$
c) $8 / 3$
d) $9 / 4$
83. Given the following grouped frequency table, in which interval does the median fall?

| Class interval | Frequency |
| :---: | :---: |
| $0-9$ | 2 |
| $10-19$ | 4 |
| $20-29$ | 10 |
| $30-39$ | 12 |
| $40-49$ | 8 |

a) $0-9$
b) 10-19
c) $20-29$
d) $30-39$
84. Suppose a frequency distribution is skewed with median 75 and mode 80 which of the following is the possible value of mean.
a) 72.5
b) 80
c) 85
d) 88
85. Earthquake intensities are measured by a device called a seismograph which is designed to be most sensitive for earthquakes with intensities between 4.0 and 9.0 on the open ended Richter scale. Measurement of the 9 earthquakes gave the following readings : 4.5, L , 5.5, H, 8.7, 8.9, 6.0, H,5.2. Here L indicates earthquake intensity is below 4 and H indicates that the earthquake intensity is above 9. The median earthquake intensity of the sample is
a) Cannot be computed as the data is not complete
b) 6
c) 5
d) 4
86. The following statistics were collected on two groups of cattle

|  | Group A | Group B |
| :--- | :---: | :---: |
| Sample size | 45 | 30 |
| Sample mean | 1000 lbs | 800 lbs |
| Sample std. Deviation | 80 lbs | 70 lbs |

Which of the following statement is correct?
a) Group $A$ is less variable that group $B$ because group A's standard deviation is larger
b) Group $A$ is relatively less variable than group $B$ because group A's coefficient of variation is smaller
c) Group $A$ is less variable than group $B$ because standard deviation per animal is smaller
d) Group $A$ is more variable than group $B$ because sample mean is larger
87. If the correlation between two variables is zero it implies that
a) Two variables are independent
b) Two variables do not have negative correlation
c) Two variables are not linearly related
d) All the above
88. In order to measure the agreement/disagreement for three judges in a beauty contest related to some qualitative traits one must calculate
a) Karl Pearson correlation coefficient
b) Kendall's Tau
c) Spearman's Rank Correlation coefficient
d) Both (b) and (c)
89. The rank according to two attributes in a sample are given below :

| R1 | 1 | 2 | 3 | 4 | 5 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| R2 | 5 | 4 | 3 | 2 | 1 |

Then rank correlation coefficient between them is
a) 0
b) +1
c) - 1
d) 0.5
90. If $r=0.6$ the coefficient of determination is
a) $60 \%$
b) $36 \%$
c) $80 \%$
d) $40 \%$
91. If $X$ and $Y$ are the original variables and $U$ and $V$ are two new variables obtained as $U=(X-a) / h$ and $V=(Y-b) / k$ where $a, b, h$, and $k$ are some constants then which of the following is true?
a) $b_{x y}=b_{u v}$
b) $\quad b_{x y}=(k / h) b_{u v}$
c) $\quad b_{x y}=(h / k) b_{u v}$
d) $\quad b_{y x}=(k / h) b_{u v}$
92. Find the mode from the following distributions

| Marks : | 10 | 12 | 15 | 20 | 25 | 35 | 45 | 50 | 60 |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| No. of students : | 4 | 6 | 10 | 14 | 20 | 19 | 10 | 6 | 3 |

a) 20
b) 35
c) 25
d) 45
93. The hourly wages of a sample of 130 system analysts are given below :

Range $=20$ mode $=70$ variance $=324$ median $=74$
The coefficient of variation equals
a) $0.24 \%$
b) $2.4 \%$
c) $24 \%$
d) $54 \%$
94. The 30 students in a class did a survey of their favourite movie series and recorded the results as follows :

| Movies | Frequency |
| :--- | :---: |
| Twilight | 10 |
| Harry Potter | 6 |
| Narnia | 2 |
| High School Musical | 9 |
| Pirates of the Caribbean | 3 |
| Total | 30 |

What was the relative frequency for High school musical?
a) 0.09
b) 0.3
c) 0.33
d) 0.43
95. The range of a sample gives an indication of the
a) way in which the values cluster about a particular point
b) number of observations bearing the same value
c) maximum variation in the sample
d) degree to which the mean value differs from its expected value
96. The mean of 11 numbers is 7 . One of the numbers, 13 , is deleted. What is the mean of the remaining 10 numbers?
a) 7.7
b) 6.4
c) 6.0
d) 5.8
97. The numerical value of the standard deviation can never be
a) larger than the variance
b) zero
c) negative
d) smaller than the variance
98. Which measure of dispersion is expressed in the same units as the units of the observations?
a) Variance
b) Coefficient of variation
c) Standard deviation
d) All the above
99. The second and fourth moments about mean are 4 and 48 respectively, then the distribution is
a) Platykurtic
b) Leptokurtic
c) Positively skewed
d) Mesokurtic
100. In order to specify "different types of cold drinks", the measurement scale used is
a) Nominal
b) Ordinal
c) Ratio
d) Interval

## ANSWER SHEET

|  | A | B | C | D | E | 26 |  | A | C | D | E |  |  |  |  | C | D | E |  | A | B | C | D | E |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 2 | A | B | C | D | E | 27 | A | A B | B | D | E | 52 | A | A | B | C | D | E | 77 | A | B | C | D | E |
| 3 | A | B | C | D | E | 28 | A | A B | B | D | E | 53 | A |  | B | C | D | E | 8 | A | B | C | D | E |
| 4 | A | B | C | D | E | 29 | A | A | - | D | E | 54 | A | A | B | C | D | E | 79 | A | B | C | D | E |
| 5 | A | B | C | D | E | 30 | A | A ${ }^{\text {a }}$ | B | D | E | 55 | A | A B | B | C | D | E | 80 | A | B | C | D | E |
| 6 | A | B | C | D | E | 1 | A | B | C | D | E |  | A |  | B | C | D | E | 81 | A | B | C | D | E |
| $7$ | A | B | C D | D | E | 2 | A | B | C | D | E |  | A |  | B | C | D | E | 82 | A | B | C | D | E |
| 8 | A | B | C D | D | E | 33 | A | B | C | D | E |  | A |  | B | C | D | E | 83 | A | B | C | D | E |
| 9 | A | B | C | D | E | 4 |  | A | C | D | E |  | A |  | B | C | D | E | 84 | A | B | C | D | E |
| 10 | A | B | C | D | E | 5 | A | B | C | D | E |  | A |  | B | C | D | E | 5 | A | B | C | D | E |
|  | A | B | C | D | E | 36 | A | A B | B | D | E |  | A |  | B | C | D | E | 86 | A | B | C | D | E |
| 12 | A | B | C | D | E | 37 | A | A | C | D | E |  | A |  | B | C | D | E | 87 | A | B | C | D | E |
|  | A | B | C | D | E | 38 | A | A | C | D | E | 3 | A |  | B | C | D | E | 88 | A | B | C | D | E |
|  | A | B | C | D | E | 39 | A | B | C | D | E | 64 | A |  | B | C | D | E | 89 | A | B | C | D | E |
|  | A | B | C | D | E |  | A | B | C | D | E |  | A |  | B | C | D | E | 0 | A | B | C | D | E |
|  | A | B | C | D | E |  | A | A ${ }^{\text {A }}$ | B | D | E |  | A |  | B | C | D | E | 91 | A | B | C | D | E |
|  | A | B | C | D | E |  | A | A | B | D | E |  | A |  | B | C | D | E | 2 | A | B | C | D | E |
|  | A | B | C | D | E |  | A | B | C | D | E |  | A |  | B | C | D | E | 93 | A | B | C | D | E |
|  | A | B | C | D | E |  | A | A | C | D | E |  | A |  | B | C | D | E | 94 | A | B | C | D | E |
|  | A | B | C | D | E | 45 |  | A | B | D | E |  | A |  | B | C | D | E | 95 | A | B | C | D | E |
|  | A | B | C | D | E | 46 |  | A | C | D | E |  | A |  | B | D | D | E | 96 | A | B | C | D | E |
|  | A | B | C | D | E |  |  | A | C | D | E |  | A |  | B | C D | D | E | 97 | A | B | C | D | E |
|  | A | B | C | D | E |  | A | A | B | D | E |  | A |  | B | C D | D | E | 98 | A | B | C | D | E |
|  | A | B | C | D | E |  | A | A | B C | D | E |  | A |  | B | C D | D | E | 99 | A | B | C | D | E |
|  | 5 A | B | C | D | E |  |  | A | C | D | E |  |  |  |  | C D | D | E |  |  | B | C | D | E |

## ROUGH WORK

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