Examination: **M.Sc Statistics**

SECTION 1 - SECTION 1

Question No.1

A set of feasible solution in linear programming problem is-

- Non-convex set
- Convex set
- Disconnected set
- None of these

Question No.2

In Stratified sampling units between strata are

- Homogeneous
- Heterogeneous
- Both Homogeneous and Heterogeneous are true
- Both Homogeneous and Heterogeneous are false

Question No.3

The efficiency of SRSWOR with respect to SRSWR is

- $\frac{N-1}{N}$
- $\frac{N-n}{N}$
- $\frac{N-1}{N-n}$
- $\frac{N}{N-1}$

Question No.4

UMP test are proposed for testing a hypothesis for which level of significance specified as 0.05. Which one of the test is most appropriate among the following?

- Test with size 0.01
- Test with size 0.04
- Test with size 0.1
- Test with size 0.06

Question No.5

Student's t statistic was pioneered by

- W.S. Gosset
- S.S. Karl Pearson
- R.A. Fisher
- Hotelling

Question No.6

Given a random sample of size 'n' from U (0, θ) distribution. Which of the following statement is not true?

- $2\overline{X}$ is an unbiased estimator of θ
- $X_{(n)}$ is an unbiased estimator of θ
- $X_{(n)}$ is maximum likelihood estimator of θ
- $X_{(n)}$ is minimal sufficient statistic for θ

Question No.7

Karl Pearson Coefficient of Skewness is given by

- $\sigma\,(Mode - Median)$

- $\frac{Mean - Mode}{\sigma}$
- $\frac{Mean - Median}{\sigma}$
- $\frac{Mode - Median}{\sigma}$

Question No.8

The trial control limits for R- chart with usual constant factors are:

- U.C.L. $= D_4 R$. C.L $= R$ and L.C.L $= D_3 R$
- all of these
- U.C.L. $= D_4 \overline{R}$. C.L $= \overline{R}$ and L.C.L $= D_3 \overline{R}$
- U.C.L. $= D_4 \overline{R}$. C.L $= \overline{R}$ and L.C.L $= D_4 \overline{R}$

Question No.9

An examination consists of two papers, paper 1 and paper2. The probability of failing in paper 1 is 0.3 and that in paper 2 is 0.2. Given that a student has failed in paper 2, the probability of failing in paper 1 is 0.6. The probability of a student in both the paper is

- 0.12
- 0.8
- 0.06
- 0.5

Question No.10

For testing equality of variances of two normal populations, we use

- Normal test
- F-test
- Chi-square test
- t-test

Question No.11

If experimental material is homogeneous, we use

- Randomised block design
- Completely Randomized Design
- Both Randomised block design and Completely Randomized Design
- Latin Square Design

Question No.12

For symmetrical distribution

- Mean=Median=Mode
- $\beta_1 = 0$
- $\beta_2 = 3$
- All of these

Question No.13

Two unbiased dice are thrown . The probability that both the dice show the same number is

- $\frac{1}{36}$
- $\frac{3}{6}$
- $\frac{5}{6}$
- $\frac{1}{6}$

Question No.14

Suppose X_1, X_2, X_3, X_4 are i.i.d. random variables taking values 1 and -1 with probability ½ each. Then $E(X_1, X_2, X_3, X_4)^4$ equals

- 16
- 4
- 76
- 12

Question No.15

If the primal of linear programming problem has no solution, then dual of the problem-

- Has either no solution or is unbounded
- Has unbounded solution
- Has an optimal solution
- None of these

Question No.16

A manufacturer of steel blades found 5% of its blade defective. He sells blades packets each containing 5 blades. The probability that a packet contains one defective blade is

- $0.25e^{-0.25}$
- 0.25
- $e^{-0.25}$
- 0.5

Question No.17

Given $\Sigma a_{ij}x_j \le b_i$, to convert it into equality we introduce-

- Artificial variable
- Slack variable
- Unrestricted variable
- Surplus variable

Question No.18

The average of male employees in a firm was Rs. 52000 and that of female was Rs. 4200. Find the percentage of male employees if the mean salary of employees was Rs. 5000.

- 50
- 80
- 60
- 20

Question No.19

Let X_1 and X_2 be independently distributed as $N(\mu_1, \sigma_1^2)$ and $N(\mu_2, \sigma_2^2)$ respectively.
Then Y= X_1- X_2 is distributed as

- $N(\mu_1 + \mu_2, \sigma_1^2 - \sigma_2^2)$
- $N(\mu_1 - \mu_2, \sigma_1^2 - \sigma_2^2)$
- $N(\mu_1 + \mu_2, \sigma_1^2 + \sigma_2^2)$
- $N(\mu_1 - \mu_2, \sigma_1^2 + \sigma_2^2)$

Question No.20

Which of the following is consistent estimator of population variance in $N(\mu, \sigma^2)$?

- $s^2 = \sum_{i=1}^{n}(x_i - \bar{x})^2 / n$
- Both $S^2 = \sum_{i=1}^{n}(x_i - \bar{x})^2 /(n-1)$ and $s^2 = \sum_{i=1}^{n}(x_i - \bar{x})^2 / n$
- $S^2 = \sum_{i=1}^{n}(x_i - \bar{x})^2 /(n-1)$
- $(s^2 + S^2)/n$

Question No.21

Let X be a binomial random variable with parameter $\left(11, \frac{1}{3}\right)$. At which value of k is $p(X = k)$ maximizes?

- k = 3
- k = 5
- k = 6
- k = 2

Question No.22

For testing a simple null hypothesis against a simple alternative hypothesis, which of the following statement is most appropriate

- UMP level 'α' test exists
- Most powerful level 'α' test exists
- UMPU level 'α' test exists
- All of these

Question No.23

If X is the number of success in n independent trials with constant probability P of success of each trial, the variance of proportion of success p=X/n is

- P/n
- nP(1-P)
- P(1-P)/n
- P(1-P)

Question No.24

Suppose X and Y are independent random variables where Y is symmetric about 0. Let U = X - Y and V = Y-X. Then

- U and V have the same distribution
- U and Y are always independent
- V is always symmetric about 0
- U is always symmetric about 0

Question No.25

Which of the following is not a principle of design of experiments?

- Randomisation
- Replication
- Universal Control
- All of these

Question No.26

Mean square error of estimators obtained by the method of minimum Chi-square is:

- equal to ML estimators
- less than ML estimators
- cannot be decided
- more than ML estimators

Question No.27

A system has three components and the system works if at least two of the three components work. The lifetimes of the components are independent and identically distributed exponential random variables with mean 1. If X denote the lifetime of the system, then E(X) is

- 5/6
- 1/2
- 1
- 2/3

Question No.28

The average incoming call rate is 4 per minute. The probability that there are not more than 3 calls, assuming Poisson distribution for incoming call rate is-

- e^{-6}
- $\frac{71}{3}e^{-4}$
-

- $-\frac{71}{3}$
- $-e4$

Question No.29

Statement A: Events are called mutually exclusive if some or all events of a trial can happen simultaneously in the same trial.
Statement B:Events of a trial are said to be equally likely if there is no reason to expect an outcome in preference to other.

Then, which of the following statements are true?

- Statement A is true
- Statement B is true
- Both statements (A) and (B) are true
- Both statements are false

Question No.30

For testing significance of difference of proportions of an attribute in two populations in large sample theory, we use

- Chi-square test
- Z-test
- t-test
- All of these

Question No.31

Correlation coefficient is measured if relationship between two variables

- Linear
- Quadratic
- Both Linear and Quadratic
- Bilinear

Question No.32

Kolmogrov-Smirnov test is useful as:

- a test of goodness of fit
- a test randomness
- a test for median
- All of these

Question No.33

Let X be distributed as Binomial (n,p). Then Y=n-X is distributed as

- Binomial(n,p)
- Binomial (n,q)
- Binomial(0,q)
- Binomial(0, p)

Question No.34

Let $X_1, X_2, ..., X_n$ be independently and identically normally distributed random variables as $N(\mu, \sigma^2)$, then their mean $\bar{X} = (X_1 + X_2 + ... + X_n)/n$ is distributed as

- $N(\mu, \sigma^2/\sqrt{n})$
- $N(\mu, \sigma^2/n)$
- $N(n\mu, \sigma^2)$
- $N(\mu, \sigma^2)$

Question No.35

If n1 and n2 in Mann-Whitney test are large, the variable U is distributed with mean:

- $\frac{(n_1+n_2)}{2}$
- $n_1 n_2$
-

$\frac{(n_1 - n_2)}{2}$

- $\frac{n_1 n_2}{2}$

Question No.36

Wilcoxon's signed-rank test considers the differences (X_i - M_o) by way of:

- Magnitude only
- Signs and magnitudes both
- All of these
- Signs only

Question No.37

In usual notations, which of the following is true?

- $y - \bar{y} = \frac{\rho \sigma_y}{\sigma_x}(x - \bar{x})$
- $y - \bar{y} = \frac{\rho \sigma_x}{\sigma_y}(x - \bar{x})$
- $y - \bar{y} = \frac{\sigma_y}{\sigma_x}(x - \bar{x})$
- $y - \bar{y} = \frac{\sigma_x}{\sigma_y}(x - \bar{x})$

Question No.38

18. The odds that a person X speaks the truth are 3:2 and the odds that the person Y speaks the truth are 5:3. The percentage of cases on which they are likely to contradict each other on an identical point are

- 47.5
- 37.5
- 20.5
- 22.5

Question No.39

The probability that a student passes a mathematics test is $\frac{2}{3}$ and the probability that he passes a General awareness test is $\frac{14}{45}$. The probability that he passes atleast one test is $\frac{4}{5}$. The probability that he passes the General awareness test is

- $\frac{2}{5}$
- $\frac{1}{5}$
- $\frac{4}{5}$
- $\frac{1}{3}$

Question No.40

Given the exponential distribution $f(x) = \frac{1}{c} e^{-\frac{x}{c}}, 0 \le x \le \infty, c > 0.$

- The moment generating function is $1+t+t^2+...$
- The second moment about the origin is $2c^2$
- The second moment about the origin is c^3.
- The moment generating function is $1+c^2 t+t^2+...$

Question No.41

Stratified sampling is always more efficient than SRS if units are selected by
- Proportional Allocation
- Neyman Allocation
- Both Proportional Allocation and Neyman Allocation are true
- None of these

Question No.42

Consider a 2^3 factorial design laid out in 2 blocks, each of size 4, as follows
Block1: 1 b c bc
Block2: ab ac a abc
Here the treatment combinations are written in Yates' notation. Then which of the following are always true?
- Main effect A is confounded
- Interactions AB, BC, AC are all unconfounded
- Interaction ABC is confounded
- All of these

Question No.43

Square of standard normal variate follows
- Standard normal variate
- Chi-square variate
- F- variate
- Beta variate

Question No.44

The desirable criteria of a good estimator are
- Unbiasedness
- Consistency
- Efficiency
- All of these

Question No.45

Given $P(A_i) = \left(\frac{1}{2}\right)^i$ and $\bigcup_{i=1}^{\infty} A_i = S$, where A_i are mutually exclusive events, then P(S) is-
- 1/3
- ∞
- 1
- 0

Question No.46

Which one of the following statements is not true?
- In a symmetric distribution the values of mean, mode and median are the same
- In a positively skewed distribution, Mean > Median > Mode
- In a negatively skewed distribution, Mode > Mean > Median
- The measure of skewness is dependent upon the amount of dispersion

Question No.47

Let $X_1, X_2, ..., X_n$ be a random sample from normal population $N(\mu, \sigma^2)$. The unbiased estimator of population mean μ is given by
- $(X_1 + X_n)/2$
- All the above
- $\bar{X} = (X_1 + X_2 + ... + X_n)/n$
- $(X_1 + X_2 + ... + X_{n-1})/(n-1)$

Question No.48

Given a random sample of size ‘n’, which of the following distribution does not possess MLR property?

- Cauchy distribution
- Weibull distribution
- Poisson distribution
- Neither Cauchy distribution nor Weibull distribution

Question No.49

Ordinary sign test utilizes:

- Poisson distribution
- Binomial distribution
- both Poisson distribution and Binomial distribution
- neither Poisson distribution nor Binomial distribution

Question No.50

A random variable X is distributed with probability density function

$f(x) = Kx(2-x), \quad 0 \le x \le 2$

The value of K is

- $\frac{1}{3}$
- $\frac{2}{3}$
- $\frac{4}{3}$
- $\frac{3}{4}$

Question No.51

A: Every solution of linear programming problem is optimal solution
B: Every optimal solution of linear programming problem is solution.

- A and B both are true
- Only A is true
- Only B is true
- Both A and B are false.

Question No.52

Let T_1 and T_2 be unbiased estimators of a parameter with variances V_1 and V_2. Then, T_1 is more efficient than T_2 if

- $\frac{V_1}{V_2} < 1$
- $\frac{V_1}{V_2} = 1$
- No conclusion is possible
- $\frac{V_1}{V_2} > 1$

Question No.53

Given a random sample of size ‘n’ from geometric distribution. Which of the following statement is true?

- $\overline{X}^2$ is minimum variance bound estimator of $\frac{q}{p}$
- $\overline{X}$ is minimum variance bound (MVB) estimator of ‘q’
- $\overline{X}$ is minimum variance bound (MVB) estimator of ‘p’
- $\overline{X}$ is minimum variance bound estimator of $\frac{q}{p}$

Question No.54

R-charts are preferable over σ-charts because:

- R and S.D. fluctuate together in case of small samples
- R is easily to calculate
- R-charts are economical
- all of these

Question No.55

Let $X_1, X_2, \ldots, X_n$ are $N(\mu,\sigma^2)$, independent then the sample mean is distributed as

- $N(\mu,\sigma^2)$
- $N(\mu,\sigma^2/n)$
- $N(\mu,\sigma/n)$
- $N(\mu,n\sigma^2)$

Question No.56

While analysing the data of a k × k Latin square, the error degrees of freedom in analysis of variance is equal to:

- k^2-2
- k^2-k-2
- k(k-1)(k-2)
- (k-1)(k-2)

Question No.57

The probability mass function of Poisson distribution $P(X,\lambda)$ with X=0,1,2,... and $\lambda > 0$ is given by

- $e^{-\lambda}\lambda^x$
- $\frac{e^{-\lambda}\lambda^x}{\lambda}$
- $\frac{e^{-\lambda}\lambda^x}{x!}$
- $\frac{e^{-\lambda}\lambda^x}{x}$

Question No.58

The characteristic function of degenerate random variable at a is

- exp(at)
- sin(at)
- exp(-iat)
- exp(iat)

Question No.59

Which of the following statements is true?

- population mean decreases with increase in sample size
- population mean decreases with decreases in sample size
- population mean increases with the increase in sample size
- population mean is a constant value

Question No.60

For estimating the population proportion P in a class of a population having N units, the variance of the estimator p of P based on simple random sample for size n is:

- $\frac{N}{N-1}\frac{PQ}{N}$
- $\frac{N}{N-1}\frac{PQ}{n}$
- $\frac{N-1}{N-n}\frac{PQ}{n}$

- $\frac{N-n}{N-1}\frac{PQ}{n}$

Question No.61

Control Charts in statistical quality control are meant for:
- describing the pattern of variation
- checking whether the variability in the product is within the tolerance limits or not
- discovering whether the variability in the product is due to assignable causes or not
- all of these

Question No.62

Suppose X is distributed as Poisson with parameter λ. Then P(X = 0) is
- $e^{-\lambda}$
- λ
- $\lambda e^{-\lambda}$
- $\lambda / e^{-\lambda}$

Question No.63

Which of the following is not considered as an assumption for t-test ?
- The sample is drawn from normal population
- The sample observations are independent
- The standard deviation of population is known
- All of these

Question No.64

Statement(I): Chi-square test is used for testing hypothetical value of population variance
Statement (II): Chi-square test is used for testing independence of attributes
Which of the above statements is true?
- Statement(I) is true
- statement (II) is true
- Both statements are true
- Both are false

Question No.65

Which of the following basis distinguishes cluster sampling and stratified sampling?
- clusters are preferably heterogeneous whereas strata are taken as homogeneous as possible
- small size clusters are better whereas there is no such restriction for stratum size
- all of these
- a sample is always drawn from each stratum whereas all the elementary units is drawn from selected clusters

Question No.66

If the sample size is large in Wilcoxon's signed rank test, the statistic T^+ is distributed with variance:
- $\frac{n(n-1)(2n+1)}{12}$
- $\frac{n(n-1)(2n-1)}{24}$
- $\frac{n(2n+1)}{12}$
- $\frac{n(n+1)(2n+1)}{24}$

Question No.67

The causes leading to vast variation in the specifications of a product are usually due to:
- random process
- assignable causes
- non-traceable causes

- all of these

Question No.68

In simple random sampling without replacement, variance of sample mean $\bar{y}$ is given by

- $V(\bar{y}) = \frac{N-n}{N} S^2$
- $V(\bar{y}) = nS^2$
- $V(\bar{y}) = \frac{N-1}{Nn} S^2$
- $V(\bar{y}) = \frac{N-n}{Nn} S^2$

Question No.69

The first two moments of a distribution about the value 4 are -1.5 and 17. The first two moments about mean are

- -1.5, 17
- 2.5, 21.0
- -5.5, 12.50
- 2.5, 14.75

Question No.70

A basic solution to the system is degenerate if-

- Some basic variables are equal to zero
- Some basic variables are negative
- Some basic variables are positive
- Some basic variables are non-zero

Question No.71

The mean deviation of observations is least if observations are measured from

- Mode
- Median
- Geometric mean
- Mean

Question No.72

A simple random sample of size 3 is drawn from a population of N units with replacement. The probability that the same unit appears in the three draws is

- $1/N^3$
- 1/N
- $1/N^2$
- (N-1)/N

Question No.73

For two attributes X and Y, the conditions of their consistency are

- (XY) $\geq (X)+(Y)-N$
- (XY) $\leq (X)$
- Statement (A) is true but (B) is false
- Both statements (A) and (B) are true

Question No.74

Let the variance of a random variable X be σ^2. Then the variance of random variable U= 2X + 3 is

- σ^2
- $4\sigma^2$
- $2\sigma^2 + 3$

$4\sigma^2 + 9$

Question No.75

Let $\{X_n: n \geq 0\}$ and X be random variables defined on a common probability space. Further assume that X_n's are non negative and X takes values 0 and 1 with probability p and 1-p respectively, where $0 \leq p \leq 1$. Which of the following statements are necessarily true?

- If $0 < p < 1$ and X_n converges to X in distribution, Then X_n converges to X in probability
- If p = 0 and X_n converges to X in distribution, Then X_n converges to X in probability
- If X_n converges to X in probability, Then X_n converges to X almost surely.
- If p = 1 and X_n converges to X in distribution, Then X_n converges to X almost surely.

Question No.76

Method of minimum Chi-square for the estimation of parameters utilizes:

- Chi-square distribution function
- Pearson's Chi-square statistic
- Contingency table
- All of these

Question No.77

An urn contains 4 white, 3 black, 2 red and 1 blue balls. Four balls are drawn randomly. The probability that they are of different colour is

- $\frac{3}{5}$
- $\frac{12}{105}$
- $\frac{4}{35}$
- $\frac{2}{5}$

Question No.78

The chances that doctor A will diagnose a disease X correctly is 60%. The chances that a patient will die by his treatment after correct diagnosis is 40% and the chances of death by wrong diagnosis is 70%. A patient of doctor A , who had disease X, died. The chance that his disease was diagnosed correctly is

- $\frac{13}{25}$
- $\frac{1}{13}$
- $\frac{6}{13}$
- $\frac{2}{25}$

Question No.79

If value of correlation coefficient between X and Y is zero, then they are

- necessarily dependent
- cannot decide
- not necessarily independent
- necessarily independent

Question No.80

The main and interaction effects in a 2^n- factorial experiment can easily be estimated with the help of:

- Simple effects
- contrasts
- both Simple effects and contrasts
- neither Simple effects nor contrasts

Question No.81

Which of the following is not a composite hypothesis?

- $H:\theta<\theta_0$
- All of these
- $H:\theta=\theta_0$
- $H:\theta>\theta_0$

Question No.82

An analysis of monthly wages paid to the workers of two firms A and B belonging to the same industry give the following results

	Firm A	Firm B
Number of workers	500	600
Average daily wages	Rs. 186.00	Rs. 175.00
Standard deviation	9	10

Then

- Firm B has larger wage bill
- Comparison of Bills is not possible
- Both firms have equal bills
- Firm A has larger wage bill

Question No.83

Significance of the partial regression coefficients can simultaneously be tested by:

- t-test
- Z-test
- Chi-square test
- F-test

Question No.84

To examine whether two different skin creams A and B have different effect on the human body n randomly chosen persons, were enrolled in a clinical trial. Then cream A was applied to one of the randomly chosen arms of each person, cream B to the other. What kind of a design is this?

- Randomized Block Design
- Balanced Incomplete Block Design
- Completely Randomized Design
- Latin Square Design

Question No.85

A Poisson distribution has a double mode at x=3 and x=4

- The probability that x=3 is $\frac{32}{3}e^{-4}$
- All of these
- The probability that x=4 is $\frac{32}{3}e^{-4}$
- The probability that x=3 or x=4 is $\frac{64}{3}e^{-4}$

Question No.86

Data on rainfall for the month of June 2013 is available for Bengaluru City. Which of the following test is most appropriate to check whether the distribution of rainfall is random?

- Wilcoxon test
- Median test
- Run test
- Sign test

Question No.87

Consider the following data-

X:	0	1	2	3	4	5	6	7	8
f:	1	9	26	59	72	52	29	7	1

The 4th decile of above data is given by

- 4
- 1
- 2
- 3

Question No.88

Binomial distribution B(n, p) tends to Poisson distribution if np= constant and

- $n \to \infty$ and $p \to 0$
- $n \to \infty$ and $p \to \infty$
- $n \to 0$ and $p \to \infty$
- $n \to 0$ and $p \to 0$

Question No.89

A cyclist pedals from his house to his college at a speed of 10 km/hr and back from the college to his house at 15 km/hr The average speed of the cyclist is

- 15 km/hr
- 12.5 km/hr
- 25 km/hr
- 12 km/hr

Question No.90

Which one problem out of the four is not related to stratified sampling?

- fixing the criterion for stratification
- fixing the number of strata
- fixing the sample size
- fixing the points of demarcation between strata

Question No.91

For estimating the population mean , let T_1 be the sample mean under srswor and T_2 under srswr. Then:

- var (T1) = 1/var(T2)
- var (T1) < var(T2)
- var (T1) = var (T2)
- var (T1) ≥ var (T2)

Question No.92

If the list of all the population unit is not available then we go for

- Systematic sampling
- Two stage sampling
- Cluster sampling
- Stratified sampling

Question No.93

Stratified sampling belongs to the category of:

- non-random sampling
- judgement sampling
- random sampling
- subjective sampling

Question No.94

In usual notations, let r_{12} = 0.77, r_{13} =0.72 and r_{23} =0.52 .The value of multiple correlation $R_{1.23}$ is

- 0.8
- 0.09
- 0.86
- 0.95

Question No.95

Which of the following distributions does not belong to exponential family?

- Gamma
- Uniform
- Normal
- Weibull

Question No.96

In sample surveys, as sample size increases
Statement (I): Variance of estimator decreases.
Statement (II): Non-sampling error increases
Which of the above statements is true?

- Statement (I) is true
- Statement (II) is true
- Both statements are true
- Both statements are false

Question No.97

The moment generating function of normal distribution $N(\mu, \sigma^2)$ is given by

- $\exp(\sigma t - \frac{1}{2}\mu^2 t^2)$
- $\exp(\mu t + \frac{1}{2}t^2\sigma^2)$
- $\exp(\mu t - \frac{1}{2}t^2\sigma^2)$
- $\exp(\sigma t + \frac{1}{2}\mu^2 t^2)$

Question No.98

$E[(aX+b)^n]$ is equal to

- $aE(X)+b^n$
- $E(a^n X)+b^n$
- $\sum_{i=0}^{n}\binom{n}{i}a^{n-i}b^{i}E(X^{n-i})$
- $\sum_{i=1}^{n}\binom{n}{i}a^{n-i}b^{n-i}E(X^{n-i})$

Question No.99

Let X and Y be independent random variables distributed Binomially as $B(n, p_1)$ and $B(n, p_2)$ respectively. Then Z=X+Y is distributed as

- $B(\frac{1}{n}, p_1 p_2)$
- $B(n, p_1 + p_2)$
- $B(\sqrt{n}, p_1 p_2)$
- $B(n^2, p_1 + p_2)$

Question No.100

Let $\bar{X}$ be the mean of a variable X. Then mean of variable U= (X- $\bar{X}$)/ $\bar{X}$ is

- 0
- -1
- 1
- $\bar{X}$