# उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,प्रयागराज

सांख्यिकी (स्नातक) कार्यक्रम अधिन्यास सत्र 2023.24

| *Course Code:* *UGSTAT-103* | *Course Title:* *Sampling Theory & Design of Experiment* | *Maximum Marks : 30* |
|---|---|---|

## Section - A
Long Answer Questions

**Note:** Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Calculate the mean and variance of SRSWOR.
2. Give the complete layout and statistical analysis of RBD. Also give its ANOVA table.

3. For SRSWOR, Prove that, $\bar{y}$ is an unbiased estimates of $\bar{Y}$ and its variance is

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

4. If population consists of a linear trend, than prove that

$$V\left(\overline{Y}_{st}\right) \geq V\left(\overline{Y}_{sys}\right) \geq V\left(\overline{Y}_{srswor}\right)$$

## Section - B
Short Answer Questions

Maximum Marks: 12

**Note:** Attempt any four questions. Answer should be given in 200 to 300 Words.

1. Discuss about the basic principle of Design of experiment.

2. Discuss about the different methods for collecting the sample under simple random sampling. (SRS)

3. Write the basic assumptions of RBD. Also discuses its advantages and disadvantages.
4. Discuss about the sources of non response errors.
5. Write a note on sampling frame and sampling unit.

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सांख्यकी (स्नातक) कार्यक्रम अधिन्यास सत्र 2023.24

| *Course Code:* *UGSTAT-104* | *Course Title : Applied Statistics* | *Maximum Marks : 30* |
|---|---|---|

## Section - A
Long Answer Questions

Note:  Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1.    Define index number. Also give an idea about the deal Index Number.
2.    Describe control charts. Also draw the steps control chart of    & R.
3.  Explain GRR and NRR. Show that NRR ≤ GRR. Why? When GRR will be equal to NRR.
4.  Explain how the principle of least square used to estimate trend in a time series.

## Section - B
Short Answer Questions

Maximum Marks: 12

Note:     Attempt any four questions. Answer should be given in 200 to 300 Words.

1.  Give the different steps for p-chart and d-chart.

2.  Discuss about the time series. Also give its different trends.

3.  Define Infant mortality rate and maternal mortality rate.
4.  Discuss about the Fisher's Index number.
5.  Give an idea about Fitting of curve through Gompertz curve.

| Course Code: UGSTAT-105 | Course Title-Advance Statistical Inference | Maximum Marks : 30 |
|---|---|---|

## Section - A
### Long Answer Questions

**Note:** Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. State and prove Crammer - Rao inequality.

2. Distinguish parametric and non parametric test.

3. Prove that the sampling from $N(\mu, \sigma^2)$ population , the sample mean is consistent estimator of $\mu$.

4. Define MVU estimators. Also obtain the MVUE for $\mu$ in the normal population $N(\mu, \sigma^2)$, where $\sigma^2$ is known.

## Section - B
### Short Answer Questions

Maximum Marks: 12

**Note:** Attempt any four questions. Answer should be given in 200 to 300 Words

1. Write short notes on (a) Power of test  (b) Level of Significance

2. Discuss about the confidence interval and confidence coefficient.

3. Define Consistent estimator.

4. Let $X_1$ , $X_2$ ........ , $X_n$ be a random sample of size n from uniform $(O, \theta)$. Then obtain sufficient estimator for $\theta$.

5. What do you mean by Hypothesis? Discuss about its type and also types of error.

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सांख्यिकी (स्नातक) कार्यक्रम अधिन्यास सत्र 2023.24

| Course Code:<br><br>DECSTAT - 106 | Course Title:<br><br>Statistical Software | Maximum Marks : 30 |
|---|---|---|

**Section- A**

Long Answer Questions

**Note:** Attempt all questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Volcanologist have measured the hydrogen content (in % of total number of atoms) of sample of gases collected from the 1970 and 1971 Mount Etna volcanic eruptions. Values are given in the following table:

| 1970 Hydrogen Content (%) | | 1971 Hydrogen Content(%) | |
|---|---|---|---|
| 35.8 | 38.5 | 42.0 | 45.0 |
| 45.5 | 36.0 | 57.0 | 44.6 |
| 35.5 | 40.5 | 42.0 | 48.5 |
| 32.0 | 35.5 | 54.5 | 63.0 |
| 50.0 | 45.5 | 35.0 | 55.0 |
| 39.0 | 37.0 | 52.0 | 40.0 |
| 37.0 | 36.0 | 43.5 | 37.5 |
| 47.0 | 53.0 | 48.0 | 53.7 |

(a) Calculate a mean hydrogen content value for the 1970 eruption and use Student's t-distribution to find the 95% confidence limits for the true value.

2. If the population of shell length to width ratios of a species of bivalve is normally distributed with a mean of 1.65 and a standard deviation of 0.05, what is the probability that any one shell picked at random has a length-to-width ratio: (i) less than 1.65 (ii) within two standard deviations of the mean.

3. For a two state Markov chain, under suitable assumptions, derive the expression for the probability that the process occupies state 1 at time n given that the initial probability vector is $(P_O \, P_1)$.

4.  Stating the underlying assumptions, give the derivation of a Poisson process.

## Section - B

Short Answer Questions

**Note:**   Answer all questions. Answer should be given in 200 to 300 Words.

Maximum Marks: 12

1.  Briefly explain the use of the following commands in MATLAB:
    a. grid ( )
    b. plot ( )
    c. title ( )

2.  Write short notes on SPSS. Also define the Data view and variable view.

3.  Find the probability distribution of inter arrival time for a Poisson process.

4.  Prove that if a Poisson process has occurred once in time interval (O,a], then the point at which it occurs is distributed uniformly over interval (0,a].

5.  Write down the steps to calculate the correlation coefficient.

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सांख्यकी (स्नातक) कार्यक्रम अधिन्यास सत्र 2023.24

| Course Code: DECSTAT-108 | Course Title - Official Statistics | Maximum Marks : 30 |
|---|---|---|

## Section - A
Long Answer Questions

**Note:** Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Discuss about the use of statistics in different fields.

2. Discuss about the various optical agencies responsible for data Collection.

3. Write an essay on the cost of living index number in India.
4. Write a detailed note on components of time series.

## Section - B
Short Answer Questions

Maximum Marks: 12

**Note:** Attempt any four questions. Answer should be given in 200 to 300 Words

1. Discuss about the GRR and NRR.

2. Discuss about the Hypothesis. Also give its types.

3. What is Census?

4. Define migration how can its effects the population of any area.
5. How can we use the principles of design of experiments in the field of Agriculture?

## उत्तर प्रदेश राजर्षि टण्डन मुक्त विश्वविद्यालय,प्रयागराज

सांख्यकी (स्नातक) कार्यक्रम अधिन्यास सत्र 2023.24

| Course Code: DECSTAT-109 | Course Title - Operation Research | Maximum Marks : 30 |
|---|---|---|

## Section - A
### Long Answer Questions

**Note:** Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Discuss about the Linear Programming Also Define the different steps for Graphical solution to LPP.

2. Write a detailed not on classification of models used in operations research.

3. Solve the following LPP :

   Max     $Z = 5x - 2y + 3z$

   subject to    $2x + 2y - z \geq 2$

   $\quad\quad\quad\quad 3x - 4z \leq 3$

   $\quad\quad\quad\quad y + 3z \leq 3$

   and    $x, y, z \geq o$

4. Define Vogel's Approximation Method (VAM).

## Section - B
### Short Answer Questions

Maximum Marks: 12

**Note:** Attempt any four questions. Answer should be given in 200 to 300 Words.

1. Discuss in brief about the Hungarian method.

2. Discuss geometric properties of LPP..

3. Soles the following LPP graphically (give all steps).

   Max. $Z = 3x + 2y$, subject to $x-y \leq 1$,   $x+ y \geq 3$ and $x, y \geq o$.

4. Write a brief note a various types of variables used in LPP.

5. Discuss about the Pay off matrix.

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सांख्यिकी (स्नातक) कार्यक्रम अधिन्यास सत्र 2023.24

| *Course Code: SBSSTAT-04* | *Course Title: Numerical Methods & Basic Computers Knowledge* | *Maximum Marks : 30* |
|---|---|---|

## Section - A
### Long Answer Questions

**Note:** Attempt any three questions. Each question should be answered in 800 to 1000 Words.

Maximum Marks: 18

1. Describe (a) Trapezoidal rule (b) Eular- Maculerain Formula

2. What is numerical differentiation? Derive the relationship between differential operator (D) and Shift operator (E).

3. Distinguish between Machine Language and Programming language. Describe high level language.

4. Write a defiled Comparative note on various low-level and high-level programme languages.

## Section - B
### Short Answer Questions

Maximum Marks: 12

**Note:** Attempt any four questions. Answer should be given in 200 to 300 Words.

1. Write short note on Simpson's one third rule
2. Discuss in brief Waddle's rule

3. Discuss about the Stirling's formula and Bessel's formula.

4. Discuss any one method of estimating missing terms with example.

5. Prove that
$$y_x = \Sigma_{i=1,2,3...} \frac{(-1)^{i+1}}{ih}(Y_{x+ih} - Y_{x-ih})$$