Department
of
Mathematics and Statistics

School of Mathematical and Physical Science

Syllabus of
Ph.D. (Statistics) Entrance Test

Date of BoS -11/06/2024

Doctor Harisingh Gour Vishwavidyalaya
(A Central University)
Sagar-Madhya Pradesh-470003

Part A: Research Methodology

1. **Foundations of Research**
   Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process.

2. **Problem Identification & Formulation**
   Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing.

3. **Research Design**
   Concept and Importance in Research – Features of a good research design Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.

4. **Qualitative and Quantitative Research**
   Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.

5. **Awareness with MS-Word,**
   File operations, text editing operations, various table designs, insertion of tables in text, use of mathematical symbols and equation editor, Use page layout and Working practice with MS-Word, Awareness with MS Excel, worksheet creation, Computations using worksheet, Use of mathematical and statistical functions, Awareness about working practice with MS-Excel.

Part B: Mathematics

1. **Probability Theory**
   Sample space, discrete probability, independent events, Bayes theorem. Random variables and distribution functions; expectation and moments. Independent random variables, marginal and conditional distributions.

2. **Stochastic Processes**
   Markov chains with finite and countable state space, classification of states, limiting behaviour of n-step transition probabilities, stationary distribution, Poisson and birth-and-death processes.

3. **Probability Distribution**
   Standard discrete and continuous univariate distributions. sampling distributions, standard errors and asymptotic distributions, distribution of order statistics and range.

4. **Statistical Inference**

Methods of estimation, properties of estimators, confidence intervals. Tests of hypotheses: most powerful and uniformly most powerful tests, likelihood ratio tests. Analysis of discrete data and chi-square test of goodness of fit. Large sample tests. Simple nonparametric tests for one and two sample problems, rank correlation and test for independence.

5. **Linear Models**

Gauss-Markov models, estimability of parameters, best linear unbiased estimators, confidence intervals, tests for linear hypotheses. Analysis of variance and covariance. Fixed, random and mixed effects models. linear regression.

6. **Multivariate Analysis**

Multivariate normal distribution, Wishart distribution and their properties. Distribution of quadratic forms.

7. **Sampling Survey**

Simple random sampling, stratified sampling and systematic sampling. Probability proportional to size sampling. Ratio and regression methods.

8. **Design of Experiments**

Completely randomized designs, randomized block designs and Latin-square designs. Connectedness and orthogonality of block designs.

9. **Operational Research**

Linear programming problem, simplex methods, duality. Elementary queuing and inventory models.

School Board Meeting held on 14th June, 2024

The School Board has approved the minute of meeting of BOS of Department of Mathematics and Statistics held on 11/06/2024.

Prof. A.K. Saxena
External Member
Department of Mathematics, Maharaja Chhatrasal
University, Chhatarpur (M.P.)

Prof. K.S. Varsney
External Member
HoD Physics, D.S. College, Aligarh, U.P.

Prof. Narendra Pandey
External Member
Department of Physics,
University of Lucknow (U.P.)

Prof. Diwakar Shukla
Member
HoD, Department of Mathematics & Statistics
Dr. Harisingh Gour V.V., Sagar (M.P.)

Prof. Ashish Verma
Member
HoD, Department of Physics
Dr. Harisingh Gour V.V., Sagar (M.P.)

Prof. R.K. Rawat
Member
Department of Applied Geology,
Dr. Harisingh Gour V.V., Sagar (M.P.)

Prof. Ranveer Kumar
Member
Department of Physics
Dr. Harisingh Gour V.V., Sagar (M.P.)

Prof. U.K. Patil
Member
Department of Pharmaceutical Science,
Dr. Harisingh Gour V.V., Sagar (M.P.)

Dr. Abhishek Bansal
Member & Associate Professor
HoD, Department of Computer Science & Applications
Dr. Harisingh Gour V.V., Sagar (M.P.)

Prof. U.K. Khedlekar
Member & Associate Professor
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Dr. Harisingh Gour V.V., Sagar (M.P.)

Dr. Rekha Garg Sonaki
Member & Associate Professor
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Dr. Harisingh Gour V.V., Sagar (M.P.)

Prof. Kamal Kant Ahirwar
Member & Assistant Professor
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Dr. Harisingh Gour V.V., Sagar (M.P.)

Dr. Mahesh Kumar Yadav
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Dr. Harisingh Gour V.V., Sagar (M.P.)

Dr. Maheshwar Panda
Member & Assistant Professor
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Dr. Harisingh Gour V.V., Sagar (M.P.)

Ms. Shivani Khare
Member & Assistant Professor
Department of Vedic Studies
Dr. Harisingh Gour V.V., Sagar (M.P.)

Prof. R.K. Bangele
Chairman, School Board & Dean, SMPS
Dr. Harisingh Gour V.V., Sagar (M.P.)