



राजा शंकर शाह विश्वविद्यालय छिंदवाड़ा (म.प्र.)

RAJA SHANKAR SHAH UNIVERSITY CHHINDWARA (M.P.)

P.G. College Campus Dharam Tekri, Chhindwara



क्र. 25914 / अका. / रा.श.श.वि. / 2025

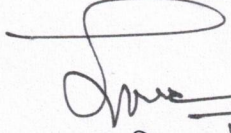
दिनांक 14/01/2025

// अधिसूचना //

सर्व संबंधितों को अधिसूचित किया जाता है कि सत्र 2024-25 में आयोजित पी-एच.डी. प्रवेश परीक्षा हेतु विभिन्न विषयों के पाठ्यक्रम निम्नानुसार होगा।

1. भाग "अ" – शोध प्रविधि (पाठ्यक्रम संलग्न है) सभी विषयों के परीक्षार्थियों हेतु अनिवार्य है।
2. भाग "ब" – हिन्दी साहित्य, अंग्रेजी साहित्य, अर्थशास्त्र, भूगोल, इतिहास, समाजशास्त्र, राजनीति शास्त्र, पुस्तकालय एवं सूचना प्रौद्योगिकी, भौतिक शास्त्र, रसायन शास्त्र, प्राणीशास्त्र, वनस्पति शास्त्र, वाणिज्य, संस्कृत, गणित एवं बायोटेक्नोलॉजी विषयों के पाठ्यक्रम मध्यप्रदेश राज्य पात्रता परीक्षा 2024 (MPSET 2024) के विषयवार पाठ्यक्रम अनुसार होगा। जिसमें निम्नांकित विषयों के परीक्षार्थी निम्नानुसार पाठ्यक्रम का अध्ययन करेंगे।

- रसायन शास्त्र के परीक्षार्थी के लिए केमिकल साइंस का पाठ्यक्रम मान्य है।
- वनस्पतिशास्त्र, प्राणीशास्त्र एवं बायोटेक्नोलॉजी के परीक्षार्थी के लिए लाईफ साइंस का पाठ्यक्रम मान्य है।
- भौतिक शास्त्र के परीक्षार्थी के लिए फिजिकल साइंस का पाठ्यक्रम मान्य है।

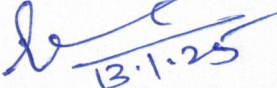

कुलसचिव 13.1.25

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प्रतिलिपि :-

- 1- आयुक्त उच्च शिक्षा विभाग सतपुड़ा भवन भोपाल की ओर सूचनार्थ।
- 2- माननीय कुलगुरु महोदय जी के निज सहायक के माध्यम से माननीय कुलगुरु महोदय जी की ओर सूचनार्थ।
- 3- संबंधित नस्ती।


13.1.25

प्रभारी अकादमिक

राजा शंकर शाह विश्वविद्यालय
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पी-एच.डी. के लिए प्रवेश परीक्षा का पाठ्यक्रम
भाग – अ
शोध प्रविधि

- 1- शोध – अर्थ, प्रकार, प्रकृति, क्षेत्र और महत्व, अनुसंधान अभिकल्प।
- 2- वैज्ञानिक पद्धति एवं अनुसंधान के चरण एवं परिकल्पना।
- 3- प्राथमिक और द्वितीयक समंक – स्रोत, उपकरण और तकनीकें।
- 4- तथ्य संग्रह, प्रस्तुति, व्याख्या और विश्लेषण।
- 5- अनुसंधान में सांख्यिकीय उपकरण और तकनीकें।
- 6- आईसीटी का उपयोग – अनुसंधान में आईसीटी का अनुसंधान में मूल बातें और उसके अनुप्रयोग।
- 7- शिक्षण और अनुसंधान योग्यता- अवधारणाएं और महत्व, सीखने के दृष्टिकोण, धारणा और व्याख्या। अध्यापन कौशल।
- 8- अनुसंधान नीतिशास्त्र एवं वैज्ञानिक अनुसंधान में नैतिकता।

SYLLABUS FOR Ph.D. ENTRANCE EXAMINATION
PART-“A”
Research Methodology

- 1- Research - Meaning, types. Importance. Scope and nature. Research design.
- 2- Scientific Method & Stage of Research and Hypothesis.
- 3- Primary and secondary Data- Sources, Tools and techniques.
- 4- Data collection, presentation, interpretation and analysis.
- 5- Statistical tools & techniques in research
- 6- Use of ICT - Basics and applications of ICT in research
- 7- Teaching & Research Aptitude - concepts and importance, approaches of learning Perception and interpretation. Thing Skills.
- 8- Research Ethics and Morality in Scientific Research.

अंक विभाजन

- I. भाग – “अ” शोध प्रविधि (अंक 50) एवं भाग – “ब” संबंधित विषय से (अंक 50) कुल अंक 100
- II. प्रत्येक प्रश्न 01 अंक का होगा एवं ऋणात्मक मूल्यांकन नहीं होगा।
- III. सभी प्रश्न बहुविकल्पीय हैं।
- IV. समय : 02 घण्टे।

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13.1.25

Raja Shankar Shah University, Chhindwara (M.P.)

Subject – Mathematics

Part- B Syllabus

UNIT – 1

Analysis: Elementary set theory, finite, countable and uncountable sets, Real number system as a complete ordered field, Archimedean property, supremum, infimum.

Sequences and series, convergence, limsup, liminf.

Bolzano Weierstrass theorem, Heine Borel theorem.

Continuity, uniform continuity, differentiability, mean value theorem.

Sequences and series of functions, uniform convergence.

Riemann sums and Riemann integral, Improper Integrals.

Monotonic functions, types of discontinuity, functions of bounded variation, Lebesgue measure, Lebesgue integral.

Functions of several variables, directional derivative, partial derivative, derivative as a linear transformation, inverse and implicit function theorems.

Metric spaces, compactness, connectedness. Normed linear Spaces. Spaces of continuous functions as examples.

Linear Algebra: Vector spaces, subspaces, linear dependence, basis, dimension, algebra of linear transformations.

Algebra of matrices, rank and determinant of matrices, linear equations.

Eigenvalues and eigenvectors, Cayley-Hamilton theorem.

Matrix representation of linear transformations. Change of basis, canonical forms, diagonal forms, triangular forms, Jordan forms.

Inner product spaces, orthonormal basis.

Quadratic forms, reduction and classification of quadratic forms

UNIT – 2

Complex Analysis: Algebra of complex numbers, the complex plane, polynomials, power series, transcendental functions such as exponential, trigonometric and hyperbolic functions. Analytic functions, Cauchy-Riemann equations.

Contour integral, Cauchy's theorem, Cauchy's integral formula, Liouville's theorem, Maximum modulus principle, Schwarz lemma, Open mapping theorem.

Taylor series, Laurent series, calculus of residues.

Conformal mappings, Mobius transformations.

Algebra: Permutations, combinations, pigeon-hole principle, inclusion-exclusion principle, derangements.

Fundamental theorem of arithmetic, divisibility in \mathbb{Z} , congruences, Chinese Remainder Theorem, Euler's ϕ -function, primitive roots.

Groups, subgroups, normal subgroups, quotient groups, homomorphisms, cyclic groups, permutation groups, Cayley's theorem, class equations, Sylow theorems.

Rings, ideals, prime and maximal ideals, quotient rings, unique factorization domain, principal ideal domain, Euclidean domain.

Polynomial rings and irreducibility criteria.

Fields, finite fields, field extensions, Galois Theory.

Topology: basis, dense sets, subspace and product topology, separation axioms, connectedness and compactness.

UNIT – 3

Ordinary Differential Equations (ODEs):

Existence and uniqueness of solutions of initial value problems for first order ordinary differential equations, singular solutions of first order ODEs, system of first order ODEs.

General theory of homogenous and non-homogeneous linear ODEs, variation of parameters,

Sturm-Liouville boundary value problem, Green's function.

Partial Differential Equations (PDEs):

Lagrange and Charpit methods for solving first order PDEs, Cauchy problem for first order PDEs.

Classification of second order PDEs, General solution of higher order PDEs with constant coefficients, Method of separation of variables for Laplace, Heat and Wave equations.

Numerical Analysis :

Numerical solutions of algebraic equations, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel methods, Finite differences, Lagrange, Hermite and spline interpolation, Numerical differentiation and integration, Numerical solutions of ODEs using Picard, Euler, modified Euler and Runge-Kutta methods.

Calculus of Variations:

Variation of a functional, Euler-Lagrange equation, Necessary and sufficient conditions for extrema. Variational methods for boundary value problems in ordinary and partial differential equations.

Linear Integral Equations:

Linear integral equation of the first and second kind of Fredholm and Volterra type, Solutions with separable kernels. Characteristic numbers and eigenfunctions, resolvent kernel.

Classical Mechanics:

Generalized coordinates, Lagrange's equations, Hamilton's canonical equations, Hamilton's principle and principle of least action, Two-dimensional motion of rigid bodies, Euler's dynamical equations for the motion of a rigid body about an axis, theory of small oscillations.

UNIT – 4

Descriptive statistics, exploratory data analysis

Sample space, discrete probability, independent events, Bayes theorem. Random variables and distribution functions (univariate and multivariate); expectation and moments. Independent random variables, marginal and conditional distributions. Characteristic functions. Probability inequalities (Tchebyshef, Markov, Jensen). Modes of convergence, weak and strong laws of large numbers, Central Limit theorems (i.i.d. case).

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.

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

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. Elementary Bayesian inference.

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. Simple and multiple linear regression. Elementary regression diagnostics. Logistic regression.

Multivariate normal distribution, Wishart distribution and their properties. Distribution of quadratic forms. Inference for parameters, partial and multiple correlation coefficients and related tests. Data reduction techniques: Principle component analysis, Discriminant analysis, Cluster analysis, Canonical correlation.

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

Completely randomized designs, randomized block designs and Latin-square designs. Connectedness and orthogonality of block designs, BIBD. 2^k factorial experiments: confounding and construction.

Hazard function and failure rates, censoring and life testing, series and parallel systems.

Linear programming problem, simplex methods, duality. Elementary queuing and inventory models. Steady-state solutions of Markovian queuing models: $M/M/1$, $M/M/1$ with limited waiting space, $M/M/C$, $M/M/C$ with limited waiting space, $M/G/1$.

NOTE- All students are expected to answer questions from Unit I. Students in mathematics are expected to answer additional question from Unit II and III. Students with in statistics are expected to answer additional question from Unit IV.