

## **PhD Entrance Syllabus**

## **Structure of the PhD Entrance Test (100 Marks)**

Section A: Aptitude and Reasoning – Common to all candidates (50 Marks)

Section B: Subject-Specific (Genetics & Plant Breeding) (50 Marks)

## Section A: APTITUDE & REASONING (Common to ALL)

#### **Unit-1: Verbal Reasoning**

Navigating Directions and Mastering Distances, Blood Relations, Logical Puzzles and Problem Solving- Floor Based, Month and Year Based. Seating Arrangements - Circular, Linear, Decoding the Code- Letter Coding, Number Coding, Letter and Number Coding.

#### **Unit-2: Number System**

Mastering Quick Calculations, BODMAS Simplified, Exploring Numbers and Division Rule, Unit Digits Decoded, Unlocking Divisibility and Counting Zeroes, "Mastering LCM and HCF: Foundations of Factorization, Uncovering Factors, Exploring Remainders.

#### **Unit-3: Arithmetic Ability-1**

Percentages - Fraction, Decimal, Percentage Change, Concept of 'By' and 'To', Product Constancy, All About Averages, Profit & Loss Essentials, Articles, False Weight, and Discount Insights - Discount, Simple Interest: Calculations and Applications, Compound Interest: Calculations and Applications, Relationship between SI and CI.

#### Unit-4: Arithmetic Ability-2

Ratio, Proportion, Partnership, Problems on Ages, Time and Work - Concept of Efficiency, Smart Work with Time and work, Negative Work, Chain Rule, Pipes and Cisterns, Time, Speed & Distance, Problems based on Trains, Problems based on Boats and Streams.

#### **Unit-5: Critical Reasoning**

Analogy and Classification, Sequence and Series Logic, Syllogisms - Types of statements, Venn diagrams using statements, Method to solve problems Two Statements and Two Conclusions, EITHER-OR Conclusions, Four Statements and Two Conclusions.



## SR University, Warangal

## Section: B Genetics & Plant Breeding Ph.D. Entrance Exam Syllabus

### I. General Genetics and Plant Breeding and Economic Botany

Mendelian inheritance. Cell structure and division, Linkage, its detection and estimation. Epistasis. Gene concept, allelism and fine structure of gene. Extra chromosomal inheritance. DNA - structure, function, replication and repair. Genetic code. Gene- enzyme relationship. Replication, Transcription and Translation. Gene regulation in prokaryotes and eukaryotes. Nuclear and cytoplasmic genome organization. Modes of sexual and asexual reproduction and its relationto plant breeding methodology. Apomixes, incompatibility and male sterility systems and their use in plant breeding. Origin, distribution, classification, description and botany of cereals (wheat, rice, maize, sorghum, pearl millet, minor millets); pulses (pigeon-pea, chickpea, black gram, green gram, cowpea, soyabean, pea, lentil, horse gram, lab-lab, rice bean, winged bean, lathyrus,Lima bean; oilseeds (groundnut, sesamum, castor, rapeseed mustard, sunflower, Niger, linseed); fibers and sugar crops, fodder and green manures; Breeding methods for self- pollinated, cross-pollinated and clonally propagated crops. Populations, their improvement methods and maintenance, Hybrid breeding and genetic basis of heterosis. Ideotype breeding. Mutation breeding.

# II. Genome organization, Cytogenetics, Genetic Engineering and Biotechnological Tools in Plant Breeding

Chromosome structure, function and replication. Recombination and crossing over. Karyotype analysis. Banding techniques. In situ hybridization. Special types of chromosomes. Chromosomal interchanges, inversions, duplications and deletions. Polyploids, haploids, aneuploids and their utility. Wide hybridization and chromosomal manipulations for alien gene transfer. Pre-and post-fertilization barriers in wide hybridization. Genome organization and cytogenetics of important crop species- wheat, maize, rice, Brassica, cotton, Vigna, potato and sugarcane. Principles and procedures of genome analysis. Cytogenetic techniques for gene location and gene transfer, Construction and use of molecular marker-based chromosome maps. Comparative mapping and genome analysis. Somatic hybridization, micro propagation, soma clonal variation, in vitro mutagenesis. Artificial

synthesis of gene. Genetic and molecular markers, generations of molecular markers and their application in genetic analyses and breeding. Molecular markers ingenetic diversity analysis and breeding for complex characters. Gene tagging, QTL mapping and marker aided selection. Genome projects and utilization of sequence formation. Genetic transformation and transgenics, Antisense RNA, RNAi and micro-RNA techniques in crop improvement.

#### III. Plant Breeding for Stress Resistance and Nutritional Quality

Genetic basis and breeding for resistance to diseases and insect-pests. Breeding for vertical and horizontal resistance to diseases. Genetic and physiological basis of abiotic stress tolerance. Breeding for resistance to heat, frost, flood, drought and soil stresses. Important quality parameters in various crops, their genetic basis and breeding for these traits. Role of molecular markers in stress resistance breeding: MAS, MARS and MABB.

## IV. Plant Genetic Resources and their Regulatory System; Varietal Release and Seed Production

Plant exploration, germplasm introduction, exchange, conservation, evaluation and utilization of plant genetic resources. Convention on Biological Diversity and International Treaty on Plant Genetic Resources for Food and Agriculture. Intellectual Property Rights. Biodiversity Act. Plant Variety Protection and Farmers' Rights Act. System of variety release and notification. Types of seeds and seed chain. Seed production and certification.

#### V. Statistical and Biometrical Methods and Field Plot Techniques

Frequency distribution. Measures of central tendency, probability theory and its applications in genetics. Probability distribution and tests of significance. Correlation, linear, partial and multiple regression. Genetic divergence. Multivariate analysis. Design of experiments- basic principles, completely randomized design, randomized block design and split plot design. Complete and incomplete block designs. Augmented design, Grid and honeycomb design. Hill plots, un- replicated evaluation. Data collection and interpretation.

Quantitative characters. Multiple factor inheritance. Genetic control of polygenic characters. Genetic advance and types of selection and correlated response. Hardy Weinberg law. Linkage disequilibrium. Genetic load. Polymorphism. Breeding value, heritability. Response to selection, correlated response. Estimates of variance components and covariance among relatives. Mating designs with random and inbred parents. Estimation of gene effects and combining ability. Effects of linkage and epistasis on estimation of genetic parameters. Maternal effects. Genotype-environment interactions and stability of performance. Heterosis and its basis.