



**PURNEA UNIVERSITY, PURNIA**

**Paper-I**

**Research Methodology - Botany**

**Full Marks: 100**

**Duration of Examination: 2 Hours**

**Questions shall consist of 3 parts:**

**Part-A : Short Questions (06 in number of which 04 to be answered, each carrying 10 marks) = 40**

**Part-B : Long Answer Question (04 to be asked of which 02 to be answered, each carrying 30 marks) = 60**

1. Introduction to Research: What is Research; Why is Research Conducted; Stages in Research; Changing Nature and Expanding Scope of Research; Why Research Methodology.
2. Introduction to Major Research Methods: Natural Observation; Historical Research; Ethnographic Research; Cross-Sectional Study; Longitudinal Study; Cohort Study; Case Study; Correlational Research; Action Research; Quantitative and Qualitative Research; theoretical research, applied research and empirical research; Experimental Research: Cause and Effect Relationships, Hypothesis in Experiments, Principles of Experimentation, Classification of Experiments, Experimental Design, Requirements of a Good Experiment; Reasoning in Research : Introduction to Logical Terms; Evidences; Inductive and Deductive Reasoning; Fallacious Reasoning; Formal and Informal Fallacies; Common Fallacies.
3. Research Design: Study designs in quantitative research; Study designs in qualitative research; Other commonly used philosophy-guided designs; Choice of Variables; Constructing hypotheses, Mechanisms and Design for Data Collection; Collection of Primary Data: Observation, Interview, questionnaire and schedule Sample Surveys and Designed Experiments, Estimation without Sampling, Methods of data collection in qualitative research; Collection of Secondary Data; Data Integration; Using Publications and the Library; Using Academic Databases: Search Engines, Citation Indexes and Citation Analysis, Government of India Initiatives for

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Knowledge Management- INFLIBNET: e-ShodhSindhu, Shodhganga, ShodhGangotri, and N-List Projects.

4. Data analysis: Statistical analysis; Thematic analysis; Analysing narrative; Discourse analysis; Content analysis; Grounded Theory; Using computers in data analysis.
5. Ethics and Related Issues in Research: Concepts in Ethics in Research; Intellectual Property Rights; Scientific Values: Needed a Code of Conduct; Fraud and Misconduct in Science; Plagiarism: What is Plagiarism, Acknowledge Sources Appropriately, Paraphrasing, Direct and Indirect Quotations, Plagiarism Checking: ShodhShuddhi, UGC (Promotion of Academic Integrity and Prevention of Plagiarism in Higher Educational Institutions) Regulations, 2018, LNMU Plagiarism Policy and Regulations-2018.
6. Writing a Research Proposal: Introduction; The research problem; Objectives of the study; Hypotheses to be tested; Study design; Measurement procedures; Analysis of data; Structure of the report; Problems and limitations.
7. The Structure of a Thesis: Thesis Vs Dissertation; Parts of a Thesis; Preliminary Pages of a Thesis: Title Pages, Certificate Pages, Acknowledgements, Table of Contents, List of Tables, List of Figures, Dedication; The Subject Proper: Introduction, Review of Literature, Materials and Methods, Results, Analysis/ Discussion, Summary/Conclusion, References, Appendixes; The Abstract; Formatting Requirements of a Thesis: Margins, Page Numbering, Design and Formatting of Chapters, Numbering the Sections, Lay-Out of Tables, Language and Style, Typeface and Fonts, Paper and Text Spacing; Thesis Editing.

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Unit II (Elective papers)

Option A : Microbial Biotechnology

Methods of isolation of microorganisms and Mycorrhiza, Microbial and algal culture techniques – sterilization, culture media, types of culture, Genetic manipulation of bacteria and fungi.

Option B : Plant Physiology and Biochemistry

Biomolecule/s interaction (DNA, RNA, Protein and Lipid), Biotin switch technique, Optimization protein extraction and purification, Antibody generation, antigen-antibody reactions (Immunichemistry), *In vitro* protein expression

Option C : Environmental Science

Sample collection- quantitative and qualitative analysis of plant, soil and water RS, GIS & GPS techniques for natural resource management, Response of organisms to environmental stress, Vegetation / community analysis, plant association, plant-sustratum relation, pollination / Bagging studies, Plant pollinator interactions.

Option D: Plant Biotechnology

Tissue culture and genetic transformation of plant, PCR and related techniques, cloning and sequencing of genes, DNA, RNA and Protein isolation from plant and its analysis (Southern, Northern, Western). Suppression subtractive hybridization techniques, site directed mutagenesis, DNA & protein based makers (RAPD, APLP, SSR, PCR< RFLP and Isozyme), RNAi technology, DRA Barcoding, Application of Bioinformatics, Introduction of data mining, computational-biology, multiple alignment and sequence search (BLAST, FASTA, CLUSTALW; Data banks, Pymol/Rasmol etc. Clustal W.

Group B 50 marks (Credit – 02)

Unit I : Project Work and Dissertation

Writing and presentation of review article related to doctoral research topic by way of dissertation during power point presentation of the semester work before the committee.

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