GANPAT UNIVERSITY

Syllabus for the Ph. D. Entrance Examination

Instructions:

1. The question paper of the Ph. D. Entrance Examination shall be of 100 marks, to be attempted in 2 hours duration.
2. The question paper will have 2 sections (Section-A and Section-B).
3. Section-A (From Research Methodology) will consist of 50 objective type questions (Multiple Choice), each carrying one mark. Section A shall be common for all the candidates appear in Entrance Examination.
4. Section-B shall be of 50 marks which is Subject specific depends on respective discipline/branch) will consist two parts.
   - Part - I shall be of 25 marks having 25 objective type of questions with multiple choice answers having only one correct answer.
   - Part - II shall be of 25 marks and having descriptive type of questions.
5. There is no negative marking.

SECTION – A

(Common for all candidates)

RESEARCH METHODOLOGY

Total Marks: 50

Unit	Content	Marks
1	Basics of Research: Research: Meaning, Objective, Characteristics, Steps of research, Methods of research, Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical.	**[05]**
2	Research Problem and Research Design Introduction to Research Problem, Necessity of Defining the Problem, Selecting the Problem, Techniques Involved in Defining a Problem, Meaning and Types of Research Design, Important Concepts Relating to Research Design	**[10]**
3	Data Collection and Analysis Methods of Data Collection- Observation, Interview, Questionnaires, Schedules, Survey and Experimental. Selection of Appropriate Method for Data Collection, Different Techniques of Sampling such as Probability and Non-Probability, Basic Statistical Methods of Data Analysis such as Frequency distribution, Measures of central tendency, Measures of Dispersion, Coefficient of variation, correlation and regression.	**[20]**
4	Ethics in Research: Environmental impacts and Ethical issues, Commercialisation, Copy right, Royalty, Intellectual property rights and Patent law, Plagiarism, Citation, Referencing style and acknowledgement.	**[05]**

5	Information and Communication Technology (ICT) in Research Word Processing, Excel, Power Point, E-journals, Internet Searching	**[10]**

Reference Books

1. 'Research Methodology- A Step-By-Step Guide for Beginners', Ranjit Kumar, (Pearson Education, Delhi) ISBN: 81-317-0496-3.
2. 'Research Methodology- Methods and Techniques', Kothari, C.K., New Age International, New Delhi.
3. Research In Education, John V. Best, John V. Kahn 10th ed., Allyn & Bacon Publisher, 2005.
4. Practical Introduction of copyright by Gavin Mcfarlane, McGraw Hill Inc., USA.
5. Introduction to Scientology Ethics, Hubbard, L. Ron. New Era Publisher, Denmark.
6. Research Methodology by Deepak Chawala, Vikas Publications.
7. Statistics for Management, Levin & Rubin, Pearson Publication

SECTION – B

Faculty of Computer Applications

Unit	Content	Marks
1	**Design and Analysis of Algorithms**	**[5]**

Algorithms, Analysis of algorithms, Asymptotic notation, Complexity of algorithms. Divide and Conquer: Binary Search, Finding Maximum and Minimum; String Processing: KMP, Boyre-Moore, Robin Karp algorithms. Greedy Method: Knapsack Problem, Job Sequencing with Deadlines, Optimal Merge Patterns.

Backtracking: 8 - Queens Problem, Sum of Subsets, Hamiltonian Cycles, Knapsack Problem. Dynamic Programming: Multistage Graphs, Optimal Binary Search Trees, 0/1 Knapsack, Reliability Design, Traveling Salesperson Problem.

Non-Deterministic Algorithm: Non-Deterministic Programming Constructs, Simple Non-Deterministic Programs; NP-Hard and NP-Complete Problems.

2	**Database Management Systems**	**[5]**

Basic Concepts of Database systems: Data modeling for a database, Abstraction and data integration, Three level architecture of a DBMS, Overview of relational, network, hierarchical data models.

Database Design: Entity Relationship model, Extended Entity Relationship model. Relational Model & Relational Data Manipulations: Relation, Conversion of ER diagrams to relations, Integrity constraints, Relational algebra, Relational domain & tuple calculus.

Structured Query Language: DDL, DML, Views, Embedded SQL, indexes, sequences, synonyms, data dictionary Relational Database Design Concepts: Functional dependencies, Determining keys, Normalization-1st, 2nd, 3rd, BCNF, 4th and 5th, Lossless join and dependency preserving decomposition.

3	**Operating Systems (with Case Study of Unix)**	**[5]**

Main functions of operating systems. Multi Programming, multiprocessing, and multitasking. Memory Management: Virtual memory, paging, fragmentation. Concurrent Processing: Mutual exclusion. Critical regions, lock and unlock. Scheduling: CPU scheduling, I/O scheduling, Resource scheduling. Deadlock and scheduling algorithms. Banker's algorithm for deadlock handling. UNIX: The Unix System: File system, process management, bourne shell, shell variables, command line programming. Filters and Commands: Pr, head, tail, cut, paste, sort, uniq, tr, join, etc. grep, egrep, fgrep, etc. sed, awk, etc. System Calls (like): Creat, open, close, read, write, iseek, link, unlink, stat, fstat, umask, chmod, exec, fork, wait, system.

4	**Software Engineering**	**[5]**

Software Life Cycle Models: SDLC Models, Selection of a Life Cycle Model. Software Requirements Analysis and Specifications: Requirements Engineering, Requirements Elicitation, Requirements Analysis, Requirements Documentation.

Software Project Planning: Size Estimation, Cost Estimation, Models, Constructive Cost Model, Software Risk Management. Software Design: Design Definition, Modularity, Strategy of Design, Function Oriented Design, IEEE Recommended Practice for Software Design Description, Object Oriented Design.

Software Metrics: Software Metrics, Token Count, Data Structure Metrics, Information Flow Metrics, Metrics Analysis. Software Reliability: Basic Concepts, Software Quality, Software Reliability Models, Capability Maturity Model.

Software Testing: Testing Process, Functional Testing, Structural Testing, Levels of Testing, Debugging, Testing Tools. Software Maintenance: Maintenance Process,

Maintenance Models, Estimation of Maintenance Costs, Regression Testing, Reverse Engineering, Software Re-engineering, Configuration Management.

5 **Computer Networks** **[5]**

Network fundamentals: Local Area Networks (LAN), Metropolitan Area Networks (MAN), Wide Area Networks (WAN), Wireless Networks, Inter Networks. Reference Models: The OSI model, TCP/IP model. Data Communication: Channel capacity. Transmission media-twisted pair, coaxial cables, fibre-optic cables, wireless transmission-radio, microwave, infrared and millimeter waves. Lightwave transmission. Thelephones-local loop, trunks, multiplexing, switching, narrowband ISDN, broadband ISDN, ATM, High speed LANS. Cellular %Radio. Communication satellites-geosynchronous and low-orbit. Internetworking: Switch/Hub, Bridge, Router, Gateways, Concatenated virtual circuits, Tunnelling, Fragmentation, Firewalls. Routing: Virtual circuits and datagrams. Routing algorithms. Conjestion control. Network Security: Cryptography-public key, secret key. Domain Name System (DNS) -Electronic Mail and Worldwide Web (WWW). The DNS, Resource Records, Name servers. E-mail-architecture and Serves.

6 **Computer Graphics** **[3]**

Development of computer Graphics: Raster Scan and Random Scan graphics storages, Displays processors and character generators, Colour display techniques, Interactive input/output devices.

Points, lines and curves: Scan conversion, Line-drawing algorithms, Circle and ellipse generation, Conic-section generation, Polygon filling anti aliasing.

Two-dimensional viewing: Co-ordinate systems, Windows and Viewport, Linear transformations, Line and polygon clipping algorithms.

Three-dimensional concepts: 3-D representations, Transformations, Perspective and parallel projections, Spline curves and surfaces, Quadtree and Octree data structures; Hidden Surface and hidden - line removal algorithms, Shading models and colour models for solid objects.

7 **Artificial Intelligence** **[4]**

A.I. Techniques and its characteristics, Problems and problem spaces, Problems as state space search, Production systems, Control Strategies, Heuristic search, Problem characteristics, Production system characteristics.

Problem Solving Methods: Forward versus backward reasoning, Problem trees versus Problem graphs, Knowledge representation and the frame problem, Generate-and-test, Hill climbing, Breadth-First-Search, Problem Reduction, Constraint satisfaction, Means-End analysis.

Game Playing: Minimax search, Alpha-beta pruning, Secondary search.

Knowledge Representation using Predicate Logic: Representing simple facts using logic, Resolution, Conversion to clause form, Resolution in clause form, Unification algorithm.

8 **Soft Computing** **[4]**

Fundamentals of ANN: The Biological Neural Network, Artificial Neural Networks, Building Blocks of ANN. ANN Terminologies: Architecture, Setting of Weights, Activation Functions, Mcculloch- Pitts Neuron Model, Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule.

Fuzzy System: Fuzzy Sets, Properties and Operations - Fuzzy Relations, Cardinality, Operations and Properties of Fuzzy Relations, Fuzzy Composition; Fuzzy Variables, Types of Membership Functions. Genetic Algorithm (GA): Biological Terminology, Elements of GA: Encoding, Types of Selection, Types of Crossover, Mutation, Reinsertion, Theoretical Foundation: Schema, Fundamental Theorems of GA.

9 **Data Warehouse & Data Mining** **[3]**

Data Warehouse: Data warehouses and data marts, metadata in the data warehouse; Defining the business requirement: Dimensional analysis, information packages, requirement-gathering methods; Architecture and Infrastructure: Data warehousing architecture, Architectural framework, Technical architecture, Collection of tools, Infrastructure supporting architecture.

Data Mining: The process of knowledge discovery in databases, Predictive and descriptive data mining techniques, Supervised and unsupervised learning techniques. Techniques of Data Mining: Link analysis, Predictive modeling, Database segmentation, Score functions for data mining algorithms, Bayesian techniques in data mining; Issues in Data Mining: Scalability and data management issues in data mining algorithms, Parallel and distributed data mining, Privacy, Social, Ethical issues in KDD and data mining, Pitfalls of KDD and data mining.

10 **Parallel Computing** **[3]**

Introduction to Parallel Computing, Advantages of Parallel Computing; Array Processors, Shared memory multi-processors, Message passing multi-processors, MMC systems; Elementary sorting algorithms; PRAM Algorithms.

Matrix algorithms: Matrix-Vector multiplication, Matrix multiplication, Matrix inversion; Graph algorithms: Mesh algorithm for transitive closure, Searching a Graph, Connected Components, All-paired Shortest Path, Single-source Shortest Path, Minimum- cost Spanning Tree.

11 **Mobile Computing** **[2]**

Mobile connectivity-Cells, Framework, wireless delivery technology and switching methods, mobile information access devices, mobile data internetworking standards, cellular data communication protocols, mobile computing applications. Mobile databases-protocols, scope, tools and technology. M-business.

12 **Information Security** **[3]**

Overview of Security: Protection versus security; Aspects of security-data integrity, data availability, privacy; Security problems, User authentication. Security Threats: Program threats, Worms, Viruses, Trojan horse, Trap door, Stack and buffer overflow; System threats-intruders; Communication threats- tapping and piracy, Intrusion detection.

Cryptography: Substitution, Transposition ciphers, Symmetric-key algorithms-Data Encryption Standard, Advanced encryption standards, Public key encryption - RSA; Diffie-Hellman key exchange.

Digital signatures: Symmetric key signatures, Public key signatures, Message digests, Public key infrastructures.

13 **Electronic Commerce** **[3]**

Building Blocks of Electronic Commerce: Introduction, internet and networking technologies, Internet and network protocols, web server scalability, software technologies for building E-commerce applications, distributed objects, object request brokers, component technology, web services, web application architectures, BizTalk framework Compliant Server.

Security of E-commerce transactions: Review of cryptographic tools, authentication, signatures, observers, anonymity, privacy, traceability, key certification, management and escrow.

Payment protocols and standards: Smart card, e-cash, e-wallet technologies, electronic money and electronic payment systems, business models for electronic commerce, electronic marketplaces, auctions and other market mechanisms, design of auctions, optimization algorithms for marketplaces, multi-agent systems.