



# DEPARTMENT OF COMPUTER SCIENCE

VIKRAMA SIMHAPURI UNIVERSITY: NELLORE – 524 004

## VSU-RECET 2010 (Ph.D. Entrance Examination) Syllabus & Model Questions

Time: 2 hours Max. Marks: 120  
(Each question carries 1 mark. The candidate has to answer 30 questions from Section A, carrying 30 marks and 90 questions from Section B, carrying 90 marks).

### SECTION - A

#### GENERAL APTITUDE (COMMON FOR ALL PG COURSES)

Reasoning (includes mathematical): Number series; Letter series; Codes; Relationship; Classification. (5 Questions)

Logical Reasoning: Understanding the Structure of arguments; evaluating the distinguishing deductive and inductive reasoning; Verbal analogies: Word analogy – Applied analogy; Verbal Classification; Reasoning logical Diagrams: Simple Diagrammatic Relationship, Multi Diagrammatic Relationship; Venn diagram; Analytical Reasoning. (10 Questions)

Data Interpretation: Sources, acquisition and interpretation of data; Quantitative and qualitative data; Graphical representation and mapping of data. (5 Questions)

Information and Communication Technology (ICT): ICT: meaning, advantages, disadvantages and uses; General abbreviations and terminology; Basics of internet and e-mail. (5 Questions)

Research Aptitude: Research: Meaning, Characteristics and types; Steps of Research; Methods of Research; Research ethics. (5 Questions)

### SECTION B

#### DISCRETE MATHEMATICAL STRUCTURES

**Mathematical Logic:** Sets and Functions –Proportional Logic First order Logic.

**Number Theory:** Mathematical Reasoning, Induction and Recursion. Recursive definitions and Structural induction, Recursive algorithms, Program correctness.

**Combinatorics:** Permutations and combinations, counting, and Summation. Generalized Permutations and Combinations, Generating Permutations and Combinations.

**Set theory and Algebra:** Relations – Relations and their properties, Groups, partial orderings; Lattice; Boolean Algebra

**Graphs Theory:** Spanning trees; cut vertices & edges; covering; matching, connectivity, Euler and Hamilton Paths; Shortest path problems, Planar Graph; and Graph coloring.

**Linear Algebra:** Algebra of matrices; determinants; system of linear equations, Eigen values and Eigen vectors.

**Probability:** Conditional Probability; Mean; Median; Mode and standard deviation; Random variables; Distributions: Uniform, normal, exponential, Poisson, Binomial.

## **COMPUTER ORGANIZATION**

**Digital Logic circuits:** Logic Functions – synthesis of Logic Functions – Minimization of Logic – Synthesis with NAND and NOR gates implementation of Logic gates.

**Sequential circuits;** Basic structures of computers: Multiprocessors and Multi computers.

## **COMPUTER ORGANIZATION AND ARCHITECTURE**

**Machine Instruction and programs:** Number representation and computer arithmetic, addressing modes; assembly language-basic input/output operations –subroutines-encoding of machine instructions. Flow control.

**Input/output organization:** accessing I/O devices-Interrupts-Direct Memory Access-buses 240-interface circuits-standard I/O interfaces.

**Memory system:** Main memory RAM; cache memories; secondary storage arithmetic: multiplication of positive members- signed operand multiplication-fast multiplication-integer division-floating point numbers and operations.

**Basic processing unit:** concepts-execution of a complete instruction-Multiple-Bus organization- hardware control-micro programmed control.

**Pipelining:** Data - data path and control constructions.

## **DATA STRUCTURES AND PROGRAMMING**

Java: Introduction-structure of a java program- Data types-Methods-Exceptions-Access Methods-Inheritance And Method-Overriding-Defining an Exception class-Generic Methods-Garbage Collection-Recursion..

Performance Analysis of programs: Space complexity-Time complexity, Asymptotic Notation: Asymptotic Mathematics - Complexity Analysis.

Abstract Data Types: The Linear List, Linked Lists, Stacks, Queues, Trees, Binary Trees-The ADT Binary Tree, Balanced Search Trees: AVL trees-Red –Black Trees-Splay Trees-B Trees.

Graphs: Properties-The ADT Graph- Graph Search Methods.

## **OPERATING SYSTEMS**

**Operating system:** Components and services-system calls, System programs, System structure, System Design. CPU Scheduling; Process Synchronization: Inter process communication, The critical-section problem, Semaphores, critical regions, monitors; Dead Locks; Memory Management: paging, segmentation; Virtual memory; Thrashing. File System: Interface; recovery, NFS. I/O systems: Mass Storage Structure: Disk; RAID

structure; Distributed System Structure: Topology, Network Types, Communication Protocols. Protection, security.

### **DATA BASE MANAGEMENT SYSTEM**

**Database Design** (integrity constraints, normal forms): Entity Relationship model. SQL: Structure of Queries- SQL data types and schemas-Integrity Constraints. The Entity-Relationship Model (relational algebra and tuple calculus), Design Issue, File structures (Sequential, indexing, B trees and B+ trees). Query Processing, Transactions, Recovery Systems.

### **DATA COMMUNICATION AND COMPUTER NETWORK**

Network models-Internet model, ISO OSI model, Analog, Digital, Transmission, FDM, WDM, TDM. Error detection and correction. LANS-Traditional Ethernet, Gigabit Ethernet Wireless LAN'S-IEEE 802.11. Flow and error control techniques. Inter-networks, Network layer protocols-ARP, IP, ICMP, IPV6, Routing- RIP, OSPF, BGP. Transport Layer: UDP, TCP, Data traffic, congestion and control. Security: Symmetric-Key Cryptography, public key cryptography, Digital signature, IPSEC, Transport Layer security, Application layer security: PGP, Firewalls, Virtual private networks.

Application Layer: Client-Server model, socket interface, DNS, DNS in the Internet, Resolution, DDNS, Electronic mail, SMTP, File Transfer, FTP, HTTP,

**Network Devices:** Hubs, switches, Gateways and routers

### **SOFTWARE ENGINEERING**

Software Engineering – Models, process life-cycle, planning, and Management of Project.

System Engineering-Business process Engineering, product engineering and system modeling. Analysis model -Requirement Analysis and Design, Testing Strategies, Software testing tactics- Product Metrics

## **DESIGN AND ANALYSIS OF ALGORITHMS**

Analysis, Asymptotic notation, Notions of space and time complexity, worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, Connected components, Spanning trees, Shortest paths; Hashing, Sorting Searching. Asymptotic analysis of time and space, upper and lower bounds, Basic concepts of complexity classes – NP, NP-hard, NP-complete.

## **DATA WARE HOUSING AND DATA MINING**

Data Mining Functionalities, Classification of Data Mining systems, Data Ware House, Multidimensional Data Model, Data Cube. Data preprocessing, Data Generalization and Summarization, Analytical characterization, Mining Association Rules in Large Databases: Association rules from Transactional Databases, Mining Multilevel association Rules from Transaction Databases, Mining Multidimensional association Rules Relational databases and data warehouses, from association mining to Constraint-Based Association Mining. Classification and Prediction, Cluster Analysis. Mining Complex Types of Data,

## **NETWORK SECURITY**

Cryptography, Steganography, DES, Conventional Encryption Algorithms, Public-Key Cryptography, Introduction to Number Theory: Prime Numbers, Modular Arithmetic, Euler's Theorem, primality and Factorization, Discrete Logarithms, Hash Functions-hash and MAC algorithms. Digital Signatures and authentication protocols, Digital Signature Standards.

## MODEL QUESTIONS

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#### SECTION – A GENERAL APTITUDE

- 1) 196, 256, 324, 400, 484, \_\_\_\_\_  
A) 576            B) 441            C) 529            D) 625
- 2)  $1/9, 2/27, 8/81, \underline{\hspace{2cm}}, 1024/729$   
A)  $32/243$         B)  $128/243$         C)  $256/243$         D)  $64/243$
- 3) A man walks 30m towards south. Then Turning to his right, he walks 30m. Then turning to his left, he walks 20m. Again, he turns to his left and walks 30m. How far is the from his initial position?  
A) 20m B) 30m C) 60m D) 50m
- 4)  $64:16::70: \underline{\hspace{2cm}}$   
A) 17.5 B) 18.5 C) 21.5 D) 20.5
- 5) Solve the given equation  
 $X^2+Y^2=34; \quad X^2-Y^2=544$   
The value of X and Y are  
A)  $\pm 4, \pm 3$         B)  $\pm 5, \pm 3$         C)  $\pm 3, \pm 5$         D)  $\pm 3, \pm 4$
- 6) Mathematical standard deviation is represented by  
A)  $\sigma = \sqrt{\frac{\sum Xi - \bar{X}}{N}}$     B)  $\sigma = \frac{\sum Xi - \bar{X}}{N}$     C)  $\sigma = \sqrt{\frac{(\sum Xi - X)^2}{N}}$   
D)  $\sigma = \sqrt{\frac{(\sum Xi + \bar{X})^2}{N^2}}$
- 7) Which of the following is not an Internet Browser?  
A) Internet Explorer    B) Netscape    C) Opera    D) AQL
- 8) Data transfer rate in Modems is measured in  
A) Bits per minute        B) Bits per Second  
C) Band Width    D) None of the Above

