Sem - IV

study today

chill tomorrow

CSE211: COMPUTER ORGANIZATION AND DESIGN

Unit 1

Basics of Digital Electronics

Registers, Shift Registers, Introduction to Combinational Circuits, Introduction to Sequential Circuits

Register Transfer and Micro Operations

Bus and Memory Transfer, Logic Micro Operations, Shift Micro Operations, Register Transfer Language, Register Transfer, Arithmetic Logic Shift Unit

Unit 2

Computer Organization

Instruction Codes, Computer Registers, Common Bus System, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input-Output and Interrupt

Unit 3

Central Processing Unit

General Register Organization, Stack Organization, Addressing Modes, Reduced Instruction Set Computer, Complex Instruction Set Computer, Instruction Formats

Unit 4

Input-Output Organization

Peripheral Devices, Input Output Interface, Data Transfer Schemes, Program Control and Interrupts, Direct Memory Access Transfer and Input-Output Processor, Priority Interrupt, Direct Memory Access Transfer, Input-Output Processor, Modes of Data Transfer, Processor Status Word

Unit 5

Memory Unit

Memory Hierarchy and Processor v/s Memory Speed, Associative Memory, Memory Management, Memory Hierarchy, Cache Memory, Virtual Memory, Main Memory, Auxiliary Memory

Unit 6

Computer Arithmetic

Addition and Subtraction Algorithm, Multiplication Algorithm

Introduction to Parallel Processing

Pipelining, Characteristics of Multiprocessors, Interconnection Structures, Parallel Processing

Latest Technology and Trends in Computer Architecture

Next generation processor architecture, Microarchitecture, Latest Processor for Smartphone or Tablet and Desktop

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CSE310: PROGRAMMING IN JAVA

Unit 1

Introduction to Java

History and Features of Java, Java program structure, Writing simple Java class and main() method, Command-Line arguments, Understanding JDK, JRE and JVM

Data In The Cart

Using primitive data types, Type Conversion, Keywords, Identifiers, Variables, Access Modifiers, Static Keyword, Wrapper Class

Operators

Working with bit-wise arithmetic, Logical and Relational operators, Unary Assignment and Ternary Operator, Operator Precedence

Conditional Statements

Using if-else constructs and switch case statements

Unit 2

Loops

Working with for loop, while loop, do-while loop and for-each loop

Arrays and Enums

Fundamental about Arrays, Multi-dimensional Arrays, Array Access and Iterations, Using varargs, Enumerations

OOP Concepts

Basics of class and objects, Writing Constructors and Methods, Overloading Methods and Constructors, this keyword, Initializer Blocks

String Class

Constructors and Methods of String and String Builder Class

Unit 3

Inheritance and Polymorphism

Inheritance, Method overriding, super keyword, Object class and overriding toString() and equals() method, Using super and final keywords, instanceof operator

Abstract Class and Interface

Abstract Method and Abstract Class, Interfaces, Static and Default Methods, Using Swing Components to demonstrate Inheritance

Unit 4

Functional Interface and Lambda Expressions

Using Lambda expressions, Implementing Threads using Lambda expressions, Implementing Listener using Lambda expressions

Nested Class

Understanding the importance of static and non-static nested classes, Local and Anonymous Class

Utility Classes

Working with Dates

Unit 5

Exceptions and Assertions

Exception Overview, Exception Class Hierarchy and Exception Types, Propagation of Exceptions, Using try, catch and finally for exception handling, Usage of throw and throws, handling multiple exceptions using multi-catch, Autoclose resources with try-with resources statement, Creating custom exceptions, Testing invariants by using assertions

I/O Fundamentals

Describing the basics of input and output in Java, Read and Write Data from the console, Using streams to read and write files, Writing and Reading objects using Serialization

Unit 6

Collections and Generics

Creating a Custom Generic Class, Using the type inference diamond to create and object, Using bounded types and Wild Cards, Creating a Collection by using Generics, Implementing and ArrayList, Implementing TreeSet using Comparable and Comparator interfaces, Implementing a HashMap, Implementing a Deque

List of Practicals/Experiments

Exception Handling

Program to demonstrate the use of all the keywords used for exception handling and need of assertion

Multithreading

Program to implement multithreading using Lambda expressions.

Creating a Java Main Class

Program to implement a Java class

Managing Multiple Items

Program to demonstrate the use of list of items

Describing Objects and Classes

Program to demonstrate the instantiation of class and accessing the attributes using object of class

Manipulating and Formatting the Data in your program

Program to demonstrate the uses of String and StringBuilder

Using Inheritance

Program to demonstrate the inheritance and its importance using Swing Components

Overriding Methods, Polymorphism, and Static Classes

Program to implement polymorphism and using proper access control

Abstract and Nested Classes

Program to demonstrate the use of abstract and nested class

Java I/O

Program to implement read and write operation using console and file

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CSE316: OPERATING SYSTEMS

Unit 1

Introduction to Operating System

Operating System meaning, Supervisor and User Mode, Review of computer organization, Introduction to popular operating systems like UNIX, Windows etc., OS Structure, System Calls, Functions of OS, Evolution of OSs

Process Management

PCB, Operations on Processes, Co-operating and Independent Processes, Inter-Process Communication, Process States, Operations on Processes, Process Management in UNIX, Process Concept, Life Cycle, Process and Threads

Unit 2

CPU Scheduling

Types of Scheduling, Scheduling Algorithms, Scheduling Criteria, CPU Scheduler-preemptive and non-preemptive, Dispatcher, First Come First Serve, Shortest Job First, Round Robin Priority, Multi-level feedback queue, Multiprocessor Scheduling, Real-time Scheduling, Thread Scheduling

Unit 3

Process Synchronization

Critical Section Problem, Semaphores, Concurrent Processes, Co-operating Processes, Precedence Graph, Hierarchy of Processes, Monitors, Dining Philosopher Problem, Reader-Writer Problem, Producer Consumer Problem, Classical Two Processes and n-process Solutions, Hardware Primitives for Synchronization

Threads

Overview, Multithreading Models, Scheduler Activations, Examples of Threaded Programs

Unit 4

Deadlocks

Deadlock Characterization, Handling of deadlocks, Deadlock Prevention, Deadlock Avoidance and Detection, Deadlock Recovery, Starvation

Protection and Security

Need for Security, Security Vulnerability like Buffer Overflow, Trapdoors, Backdoors, Cache Poisoning etc., Authentication-Password based authentication, Password Maintenance and Secure Communication, Application Security, Virus, Program Threats, Goals of Protection, Principles of Protection, Domain of Protection, Access Matrix, Implementation of Access Matrix, System and Network Threats, Examples of attacks

Unit 5

Memory Management

Logical and Physical Address Space, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Page Replacement Algorithms, Segmentation-simple, multilevel with paging, Page Interrupt Fault, Fragmentation-internal and external, Schemes-Paging-simple and multilevel, Overlays-swapping, Virtual Memory Concept, Demand Paging

Unit 6

File Management

File Concepts, Access Methods, Directory Structure, File System Mounting and Sharing, Protection, Allocation Methods, Free-space Management, Directory Implementation

Device Management

Dedicated, Shared and Virtual Devices, Serial Access and Direct Access Devices, Disk Scheduling Methods, Direct Access Storage Devices, Channels and Control Units

Inter Process Communication

Introduction to IPC(Inter Process Communication) Methods, Pipes – popen and pclose functions, Co-processes, Shared Memory, Stream Pipes, FIFOs, Message Queues, Passing File Descriptors, Semaphores

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CSE325: OPERATING SYSTEMS LABORATORY

List of Practicals / Experiments

Process Creation and Handling

- Creating Processes
- Creating Threads
- Process Duplication using fork()
- Creating Threads using pthread
- Environment Variables
- Replacing process image using execlp

Inter-Process Communication

- Pipes, popen and pclose functions
- Stream pipes, passing file descriptors
- Shared Memory
- Message Passing
- Remote Procedure Calls

Introduction to Linux

- Basic Linux Commands: ls, cat, man, cd, touch, cp, mv, rmdir, mkdir, rm, chmod, pwd
- System Calls: Read, Write, Open
- Lseek

Synchronization

- Synchronization with Mutexes
- Synchronization with Semaphores
- Race Condition

Shell Programming

- Variables
- Standard Input/Output Redirection
- Shell Arithmetic
- Flow Control and Decision Making

File and Directory Management using System Calls

- File related system calls open, read, write, lseek, close
- Directory related system calls opendir, readdir, closedir

CSE408: DESIGN AND ANALYSIS OF ALGORITHMS

Unit 1

Foundation of Algorithm

Algorithms, Fundamentals of Algorithmic Problem Solving, Basic Algorithm Design Techniques, Analyzing Algorithm, Fundamental Data Structure, Linear Data Structure, Graphs and Trees, Fundamentals of the Analysis of Algorithm Efficiency, Measuring of Input Size, Units for Measuring Running Time, Order of Growth, Worst-Case, Best-Case, and Average-Case Efficiencies, Asymptotic Notations and Basic Efficiency Classes, O(Big-oh)-notation, Big-omega notation, Big-theta notation, Useful Property Involving the Asymptotic Notations, Using Limits for Comparing Orders of Growth

Unit 2

String Matching Algorithms and Computational Geometry

Sequential Search and Brute-Force String Matching, Closest-Pair and Convex-Hull Problem, Exhaustive Search, Voronoi Diagrams, Naiva String-Matching Algorithm, Rabin-Karp Algorithm, Knuth-Morris-Pratt Algorithm

Unit 2

Divide and Conquer and Order Statistics

Merge Sort and Quick Sort, Binary Search, Multiplication of Large Integers, Strassen's Matrix Multiplication, Substitution Method for Solving Recurrences, Recursion-Tree Method for Solving Recurrences, Master Method for Solving Recurrence, Closest-Pair and Convex-Hull Problems by Divide and Conquer, Decrease and Conquer: Insertion Sort, Depth-First Search and Breadth-First Search, Connected Components, Topological Sort, Transform and Conquer: Presorting, Balanced Search Trees, Minimum and Maximum, Counting Sort, Radix Sort, Bucket Sort, Heaps and Heapsort, Hashing, Selection Sort and Bubble Sort

Unit 4

Dynamic Programming and Greedy Techniques

Dynamic Programming: Computing a Binomial Coefficient, Warshall's and Floyd's Algorithm, Optimal Binary Search Trees, Knapsack Problem and Memory Functions, Matrix-Chain Multiplication, Longest Common Subsequence, Greedy Technique and Graph Algorithm: Minimum Spanning Trees, Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Code, Single-Source Shortest Paths, All-Pairs Shortest Paths, Iterative Improvement: The Maximum-Flow Problem, Limitations of Algorithm Power: Lower-Bound Theory

Unit 5

Backtracking and Approximation Algorithms

Backtracking: n-Queens Problem, Hamiltonian Circuit Problem, Subset-Sum Problem, Branch-and-Bound: Assignment Problem, Knapsack Problem, Traveling Salesman Problem, Vertex-Cover Problem and Set-Covering Problem, Bin Packing Problems

Unit 6

Number-Theoretic Algorithms and Complexity Classes

Number Theory Problems: Modular Arithmetic, Chinese Remainder Theorem, Greatest Common Divisor, Optimization Problems, Basic Concepts of Complexity Classes- P, NP, NP-hard, NP-complete Problems

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INT404: ARTIFICAL INTELLIGENCE

Unit 1

Introduction

What is Intelligence? What is Artificial Intelligence? Foundations of Artificial Intelligence (AI), History of AI, Basics of AI, AI Problems, AI Techniques, Applications of AI, Branches of AI

Problem Spaces and Search

Defining the problem as a state space search, Production Systems, Problem Characteristics, Production System Characteristics, Issues in Designing Search Problems, Breadth First Search, Depth First Search, Bidirectional Search, Iterative Deepening

Unit 2

Informed Search Strategies

Hueristic Functions, Generate and Test, Hill Climbing, Simulated Annealing, Best First Search, A* algorithm, Constraint Satisfaction

Unit 3

Knowledge Representation

Representations and Mappings, Approaches in Knowledge Representation, Issues in Knowledge Representation, Propositional Logic, Predicate Logic, Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning

Unit 4

Statistical Reasoning

Probability and Bayes' Theorem, Baeyesian Networks, Dempster-Shafer-Theory, Certainty Factors and Rule-Based Systems

Weak Slot and Filler Structures

Semantic Nets, Frames

Weak Slot and Filler Structures

Conceptual Dependency, Scripts

Unit 5

Game Playing

Evaluation Function, Min-Max Problem, Min-Max Search Procedure, Alpha-Beta Cutoffs, Alpha-Beta Pruning

Natural Language Processing

Introduction to NLP, NLP Phases, Consutruction of Parse Tree, Spell Checking, Bag of Words Model, Soundex Algorithm, Applications of NLP, Alex, Siri and Cortana

Unit 6

Advanced Topics in Artificial Intelligence

Definition of Machine Learning, Types of Machine Learning, Supervised Learning, Unsupervised Learning, Reinforcement Learning, Overview of Neural Networks, Overview of Genetic Algorithms, Overview of Fuzzy Logic

Current Trends in AI

Augmented Workforce, AI in Cybersecurity, Explainable AI, AI and the metavers, autonomous vehicles

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MTH302: PROBABILITY AND STATISTICS

Unit 1

Basics of Probability

Sample Space, Events, Counting Sample Points, Probability of an Event, Additive Rules, Conditional Probability, Multiplicative Rules, Bayes' Rule

Unit 2

Random Variables and its Characterization

Discrete and Continuous Random Variables and their Distrubutions Functions, Joint Probability Distrubutions, Mean of a Random Variable, Variance and Covariance of Random Variables, Chebyshov's Theorem

Unit 3

Special Distributions

Bernoulli Process, Binomial Distribution, Negative Binomial and Geometric Distributions, Poisson Distribution and Poisson Process, Gamma and Exponential Distributions, Normal Distribution

Unit 4

Central Limit Theorem and Point Estimation

Central Limit Theorem, Unbiased Estimators, Consistent Estimator, Maximum Likelihood Estimation

Unit 5

Hypothesis Testing

Types of Error, Student t-test for Single Mean and Difference of Means, Z-Test for Single Mean and Difference of Means, F-Test, Goodness of Fit, Chi-Square Test

Unit 6

Correlation and Regressions

Scatter Plots, Coefficient of Correlation, Coefficient of Correlation for Bivariate data and Probability Distribution, Spearman's Rank Correlation Coefficient, Linear Regression, Properties of Regression Coefficients, Fitting of a Curve

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PEA307: ADVANCED ANALYTICAL SKILLS-I

Unit 1

Number System

Factors, Factorials, Unit Digit Calculation, Remainder Properties, Advanced Number Based Questions, HCF and LCM

Average

Inclusion and Exclusion related questions, Missing Number Questions, Questions based on cricket

Linear Quadratic Equations

Statement based questions, Roots of the Quadratic Equation

Unit 2

Percentage

Percentage to Fraction, Population Change in Percentage, Percente Increase and Decrease, Questions based on Examination and Election

Profit Loss Discount

Concepts of Cost Price Selling Price and Marked Price, Successive Discount, Questions based on Selling an Article and Interchanging its values, Dishonest Seller related questions

Simple and Compound Interest

Concepts of Interest Calculations, Questions based on the difference between CI and SI, EMI Calculations

Unit 3

Logical Reasoning

Flow Chart

Analytical Reasoning

Coding and Decoding, Number, Alphabet Series Questions, Language Coding Questions

Unit 4

Ratio and Proportions

Questions based on addition, differnce and product, questions based on Income and Expenditure, questions based on Coins and Rupees, Problems based on Ratio and Proportion and Ages, problems based on Partnerships and Profit Sharing

Alligations and Mixtures

Conceptual Knowledge of Alligation and Mixtures, Problems based on Alligation and Mixtures

Unit 5

Permutation

Counting Method, Numerical Permutation (formation of numbers and sum of numbers), Alpha Permutation (Rearrangement of words and Rank of Words), Logical Permutation, Linear and Circular Permutation

Combination

Formulas of Combination, Combination of Identical Objects, Distrubution Based Questions, formation of Committee

Probability

Classification of Events, Conditional Probability, Problems based on Coins, Dices and Cards, PnC based Probability questions

Unit 6

Logical Reasoning 1

Visual Reasoning, Mirro/Water Image, Paper Cutting and Folding, Completion of Figure, Embedded Figure, Deviation of Figure

Analytical Reasoning 1

Direction Sense: Questions Based on Determining Directions and Distance, Blood Relational: Questions Based on English Alphabet Problem, Question based on Word Problems