Visvesvaraya Technological University, Karnataka B.E./B.Tech CSE Sem 4 syllabus

Computer Organization

UNIT - 1 Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Performance – Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement, Historical Perspective Machine Instructions, and Programs: Numbers, Arithmetic Operations and Characters, Memory Location and Addresses, Memory Operations, Instructions, and Instruction Sequencing,

UNIT - 2 Machine Instructions and Programs contd.: Addressing Modes, Assembly Language, Basic Input and Output Operations, Stacks and Queues, Subroutines, Additional Instructions, Encoding of Machine Instructions

UNIT - 3 Input/Output Organization: Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Controlling Device Requests, Exceptions, Direct Memory Access, Buses

UNIT - 4 Input/Output Organization contd.: Interface Circuits, Standard I/O Interfaces – PCI Bus, SCSI Bus, USB

UNIT - 5 Memory System: Basic Concepts, Semiconductor RAM Memories, Read Only Memories, Speed, Size, and Cost, Cache Memories – Mapping Functions, Replacement Algorithms, Performance Considerations, Virtual Memories, Secondary Storage.

UNIT - 6 Arithmetic: Addition and Subtraction of Signed Numbers, Design of Fast Adders, Multiplication of Positive Numbers, Signed Operand Multiplication, Fast Multiplication, Integer Division, Floating-point Numbers, and Operations

UNIT - 7 Basic Processing Unit: Some Fundamental Concepts,

Execution of a Complete Instruction, Multiple Bus Organization, Hard-wired Control, Microprogrammed Control

UNIT - 8 Multicores, Multiprocessors, and Clusters: Performance, The Power Wall, The Switch from Uniprocessors to Multiprocessors, Amdahl‟s Law, Shared Memory Multiprocessors, Clusters and other Message Passing Multiprocessors, Hardware Multithreading, SISD, IMD, SIMD, SPMD, and Vector.

Design and Analysis of Algorithms

UNIT – 1 INTRODUCTION: Notion of Algorithm, Review of Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms Brute Force Approaches: Introduction, Selection Sort, and Bubble Sort, Sequential Search and Brute Force String Matching.

UNIT - 2 DIVIDE AND CONQUER: Divide and Conquer: General Method, Defective Chess Board, Binary Search, Merge Sort, Quick Sort, and its performance.

UNIT - 3 THE GREEDY METHOD: The General Method, Knapsack Problem, Job Sequencing with Deadlines, Minimum-Cost Spanning Trees: Prim‟s Algorithm, Kruskal‟s Algorithm; Single Source Shortest Paths.

UNIT - 4 DYNAMIC PROGRAMMING: The General Method, Warshall‟s Algorithm, Floyd‟s Algorithm for the All-Pairs Shortest Paths Problem, Single-Source Shortest Paths: General Weights, 0/1 Knapsack, The Traveling Salesperson problem.

UNIT - 5 DECREASE-AND-CONQUER APPROACHES, SPACE-TIME TRADEOFFS: Decrease-and-Conquer Approaches: Introduction, Insertion Sort, Depth First Search and Breadth-First Search, Topological Sorting Space-Time Tradeoffs: Introduction, Sorting by Counting, Input Enhancement in String Matching.

UNIT – 6 LIMITATIONS OF ALGORITHMIC POWER AND COPING WITH THEM: Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems, Challenges of Numerical Algorithms.

UNIT - 7 COPING WITH LIMITATIONS OF ALGORITHMIC POWER: Backtracking: n - Queens problem, Hamiltonian Circuit Problem, Subset – Sum Problem. Branch-and-Bound: Assignment Problem,

Knapsack Problem, Traveling Salesperson Problem. Approximation Algorithms for NP-Hard Problems – Traveling Salesperson Problem, Knapsack Problem

UNIT – 8 PRAM ALGORITHMS: Introduction, Computational Model, Parallel Algorithms for Prefix Computation, List Ranking, and Graph Problems.

Engineering Mathematics - IV

UNIT – 1 Numerical Method: Numerical solutions of first-order and first-degree ordinary differential equations – Taylor‟s series method, Modified Euler‟s method, Runge – Kutta method of fourth-order, Milne‟s and Adams-Bashforth predictor and corrector methods (All formulae without Proof).

UNIT – 2 Complex Variables: Function of a complex variable, Limit, Continuity Differentiability – Definitions. Analytic functions, Cauchy – Riemann equations in cartesian and polar forms, Properties of analytic functions. Conformal Transformation – Definition Discussion of transformations: W = z2, W = ez, W = z + (I/z), z ≠ 0 Bilinear transformations.

UNIT – 3 Complex Integration: Complex line integrals, Cauchy‟s theorem, Cauchy‟s integral formula. Taylor‟s and Laurent‟s series (Statements only) Singularities, Poles, Residues, Cauchy‟s residue theorem (statement only)

UNIT – 4 Series solution of Ordinary Differential Equations and Special Functions: Series solution – Frobenius method, Series solution of Bessel‟s D.E. leading to Bessel function of fist kind. Equations reducible to Bessel‟s D.E., Series solution of Legendre‟s D.E. leading to Legendre Polynomials. Rodrigue‟s formula.

UNIT - 5 Statistical Methods Curve fitting by the method of least squares: y = a + bx, y = a + bx + cx2, y = axb y = abx, y = aebx, Correlation and Regression. Probability: Addition rule, Conditional probability, Multiplication rule, Baye‟s theorem.

UNIT – 6 Random Variables (Discrete and Continuous) p.d.f., c.d.f. Binomial, Poisson, Normal, and Exponential distributions.

UNIT - 7 Sampling, Sampling distribution, Standard error. Testing of hypothesis for means. Confidence limits for means, Student‟s t

distribution, Chi-square distribution as a test of goodness of fit.

UNIT - 8 Concept of joint probability – Joint probability distribution, Discrete and Independent random variables, Expectation, Covariance, Correlation coefficient Probability vectors, Stochastic matrices, Fixed points, Regular stochastic matrices. Markov chains, Higher transition probabilities. Stationary distribution of regular Markov chains and absorbing states.

Microprocessors

UNIT – I Introduction, Microprocessor Architecture – 1: A Historical Background, The Microprocessor-Based Personal Computer Systems. The Microprocessor and its Architecture: Internal Microprocessor Architecture, Real Mode Memory Addressing.

UNIT – 2 Microprocessor Architecture – 2, Addressing Modes: Introduction to Protected Mode Memory Addressing, Memory Paging, Flat Mode Memory Addressing Modes: Data Addressing Modes, Program Memory Addressing Modes, Stack Memory Addressing Modes

UNIT – 3 Programming – 1: Data Movement Instructions: MOV Revisited, PUSH/POP, Load-Effective Address, String Data Transfers, Miscellaneous Data Transfer Instructions, Segment Override Prefix, Assembler Details. Arithmetic and Logic Instructions: Addition, Subtraction, and Comparison, Multiplication and Division.

UNIT - 4 Programming – 2: Arithmetic and Logic Instructions (continued): BCD and ASCII Arithmetic, Basic Logic Instructions, Shift and Rotate, String Comparisons. Program Control Instructions: The Jump Group, Controlling the Flow of the Program, Procedures, Introduction to Interrupts, Machine Control and Miscellaneous Instructions.

UNIT - 5 Programming – 3: Combining Assembly Language with C/C++: Using Assembly Language with C/C++ for 16-Bit DOS Applications and 32-Bit Applications Modular Programming, Using the Keyboard and Video Display, Data Conversions, Example Programs

UNIT - 6 Hardware Specifications, Memory Interface – 1: Pin-Outs and the Pin Functions, Clock Generator, Bus Buffering and Latching, Bus Timings, Ready and Wait for State, Minimum versus Maximum

Mode. Memory Interfacing: Memory Devices

UNIT – 7 Memory Interface – 2, I/O Interface – 1: Memory Interfacing (continued): Address Decoding, 8088 Memory Interface, 8086 Memory Interface. Basic I/O Interface: Introduction to I/O Interface, I/O Port Address Decoding.

UNIT 8 I/O Interface – 2, Interrupts, and DMA: I/O Interface (continued): The Programmable Peripheral Interface 82C55, Programmable Interval Timer 8254. Interrupts Basic Interrupt Processing, Hardware Interrupts INTR and INTA/; Direct Memory Access: Basic DMA Operation and Definition.

Unix and Shell Programming

UNIT – 1 The Unix Operating System, The UNIX architecture and Command Usage, The File System

UNIT - 2 Basic File Attributes, the vi Editor

UNIT – 3 The Shell, The Process, Customizing the environment

UNIT - 4 More file attributes, Simple filters

UNIT – 5 Filters using regular expressions,

UNIT – 6 Essential Shell Programming

UNIT - 7 awk – An Advanced Filter

UNIT - 8 Perl - The Master Manipulator

Graph Theory and Combinatorics

UNIT - 1 Introduction to Graph Theory: Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree, Euler Trails and Circuits

UNIT – 2 Introduction to Graph Theory contd.: Planar Graphs, Hamilton Paths and Cycles, Graph Colouring, and Chromatic Polynomials

UNIT - 3 Trees: Definitions, Properties, and Examples, Routed Trees, Trees and Sorting, Weighted Trees and Prefix Codes

UNIT - 4 Optimization and Matching: Dijkstra‟s Shortest Path Algorithm, Minimal Spanning Trees – The algorithms of Kruskal and Prim, Transport Networks – Max-flow, Min-cut Theorem, Matching Theory.

UNIT - 5 Fundamental Principles of Counting: The Rules of Sum and Product, Permutations, Combinations – The Binomial Theorem, Combinations with Repetition, The Catalon Numbers.

UNIT - 6 The Principle of Inclusion and Exclusion: The Principle of Inclusion and Exclusion, Generalizations of the Principle, Derangements – Nothing is in its Right Place, Rook Polynomials.

UNIT - 7 Generating Functions: Introductory Examples, Definition, and Examples – Calculational Techniques, Partitions of Integers, the Exponential Generating Function, the Summation Operator.

UNIT - 8 Recurrence Relations: First Order Linear Recurrence Relation, The Second Order Linear Homogeneous Recurrence Relation with Constant Coefficients, The Non-homogeneous Recurrence Relation, The Method of Generating Functions.