S.E. Sem. IV [INFT]

Computational Mathematics

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

Term Work : 25 Marks

1. **Numerical Methods :**
   - **Errors :** Types and Estimation
   - **Solutions to Transcendental and polynomial equations :** Bisection method, Newton-Raphson method, Secant method
   - **Numerical Integration :** Trapezoidal Rule, Simpson's 1/3 rd and $3/8^{th}$ rules.
   - Solution to system of linear algebraic equations, Gauss elimination methods, Gauss-Jordan elimination method, Gauss-Siedel iteration method.
   - **Interpolation :** Linear interpolation, Higher order interpolation using Lagrange's and Newton's method, Finite difference operators and difference tables.

2. **Statistics :**
   - Probability
   - **Random variables :** Discrete and Continuous random variables, Probability density function, Probability distribution of random variables, Expected value, Variance.
     Moments and moment generating functions, Relation between Raw moments and Central moments.
   - Binomial, Poisson and Normal distributions for detailed study, Central Limit theorem (statement only) and problems based on this theorem.
   - **Fitting of curves :** Least square method, Fitting the straight line and parabolic curve, Correlation, Covariance, Karl Pearson's coefficient and Spearman's Rank correlation coefficient, Regression coefficients and lines of regression.

3. **Sampling Theory :**
   - Sampling distribution, Test of Hypothesis, Level of Significance, Critical Region, One Tailed and Two Tailed Test, Interval Estimation of Population Parameters, Test of Significance for large Samples and Small Samples, Students 't' Distribution and its properties, Chi-Square Distribution and its properties, Test of the Goodness of fit and Independence of Attributes, Contingency Table, Yates Correction

4. **Mathematical Programming :**
   - Linear optimization problem, Formulation and Graphical solution, Basic solution and Feasible solution, Primal Simplex Method.

5. **SCILAB Applications :**
   - Programming of Numerical Methods.
   - Use of Scilab for solving system of linear equations.
   - Use of Scilab in Curve Fitting.
   - Use of Scilab for finding coefficient of correlation and regression coefficient.

References :

1. "Elements of Applied Mathematics" (*P. N. Wartikar and J. N. Wartikar*) Volume 1 and 2, A. V. Griha, Pune.
2. "Engineering Mathematics" (*S. S. Shastri*) Vol-2, PHI, 2nd Edition, 1994.
3. "Introductory Methods of Numerical Methods" (*S. S. Shastri*) Vol-2, PHI, 2nd Edition, 1994.
4. "Applied Numerical Methods for Engineers using SCILAB & C" (*Robert J. Schilling & Sandra L. Harris*) Thomson Brooks / Cole.
5. "Fundamentals of Mathematical Statistics" (*S. C. Gupta, V. K. Kapoor*)
6. "Matrices" (*Shantinarayan*) S. Chand Publication House, Delhi.
7. "Probability and Statistics" (*T. Veerarajan*) TMH
8. "Higher Engineering Mathematics" (*Dr. B. S. Grawal*) Khanna Publications.
9. "Advanced Engineering Mathematics" (*Erwin Kreyszing*) Wiley India, 8th Edition.
10. "Numerical Methods for Mathematics, Science & Engineering" (*John S. Mathews*

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Internet Programming

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Practical : 25 Marks
Oral : 25 Marks

1. **Introduction to Web :**
   History, web system architecture, URL, Domain Name System, overview of HTTP, HTTP request-response, generation of dynamic web pages, cookies.

2. **Markup Language HTML :**
   Introduction, Basic HTML, Formatting and Fonts, Commenting Code, Anchors, Backgrounds, Images, Hyperlinks, Lists, Tables, Frames, Simple HTML Forms, XHTML.

3. **Cascadding Style Sheet (CSS) :**
   The need for CSS, Introduction to CSS, Basic syntax and structure, using CSS, manipulating text, padding, lists, positioning using CSS.

4. **Java Script and DHTML :**
   What is JavaScript ? How to develop JavaScript, simple JavaScript, variables, functions, conditions, JavaScript and Objects, JavaScript's own Objects, the DOM and the Web browser Environment, forms and validation.

5. **Server Side Programming I :**
   Introduction to Servlets in Java, Active Server Pages (ASP) : Objects; Queries & forms; Java Server Pages (JSP)

6. **Server Side Programming II :**
   Session Tracking : Introduction, Traditional session tracking techniques, the servlet / ASP session tracking API.

7. **Server Side Programming III :**
   Database Connectivity : Introduction, Relational database systems, JDBC perspectives, JDBC program example.

8. **Introduction to Web Extension :**
   XML, Introducing XSL, XML transformed, XSL elements, transforming with XSLT, XML with CSS, web feeds (RSS), Introduction to web services.

References :

1. Developing Web Applications (*Ralph Moseley, Middlesex University*) Wiley publications.
2. E-Commerce Fundamentals and Applications (*Henry Chan, Raymond Lee, Tharam Dillon*) Wiley publications.
3. Web Applications (*Craig, D. Knuckles, David S. Yuen*) Wiley publications.
4. "HTML Black Book" (*Steven Holzner*) Dreamtech press.
5. "JAVA script for World Wide Web" (*Tom Negrino and Dori Smith*)

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Microprocessors & Microcontrollers

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

Term Work : 25 Marks

1. **Introduction to 8086 Microprocessor & Architecture**
   Introduction to Microprocessors, Architecture of 8086 family, 8086 Hardware Design, Minimum mode & Maximum mode of Operation. Study of bus controller 8288 & its use in maximum mode. System Timing diagram.

2. **8086 Instruction Set & Programming :**
   Addressing modes, Instruction Set, Assembly Language Programming, Mixed Language Programming, Programs Based on Stacks, Strings, Procedures, Macros, Timers, Counters & delay

3. **Introduction to 8051 Microcontrollers**
   Microprocessors vs microcontrollers. The 8051 microcontroller architecture, 8051 assembly language programming, jump, loop and call instructions, i/o port programming, 8051 addressing modes, arithmetic & logic instructions and programs, 8051 programming in c.

4. **Hardware interfacing for microcontrollers**
   8051 hardware connection and Intel hex file, 8051 timer programming in assembly and c, 8051 serial port programming in assembly and c, interrupts programming in assembly and c, lcd and keyboard interfacing, adc, dac, and sensor interfacing, 8051 interfacing to external memory, 8051 interfacing with the 8255, DS12887 RTC interfacing and programming, motor control : relay, pwm, dc, and stepper motors.

5. **Introduction to PIC microcontrollers**
   Introduction to Microchip PIC family of Microcontrollers and development tools. CPU architecture and instruction set, Harvard Architecture and Pipelining. Program memory considerations, Register file structure and addressing modes. CPU Registers, Instruction set.

References :

1. Microprocessors and Interfacing (*Douglas V. Hall*) Tata Mc Graw Hill
2. The 8051 Microcontroller and Embedded systems (*Muhammad Ali Mazidi*) Pearson Education Asia LPE.
3. 8051 Microcontrollers programming and practice (*Mike Predcko*)
4. Microchip Midrange Embedded Microcontrollers Handbook
5. Intel or Atmel MCS 51 Family Microcontrollers Data Sheets
6. Design with PIC Microcontrollers (*John B. Peatman*) Pearson Education Asia. LPE.
7. The 8086/8088 Family (*John Uffenbuck*) Pearson Media, LPE
8. The 8051 Microcontroller Architecture, Programming and application (*Kenneth Ayala*) Penram International.
9. Embedded Systems (*Rajkamal*) Tata McGraw Hill.

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Networking Technology for Digital Devices

SYLLABUS

Time : 3 Hrs.

Theory : 100 Marks
Term Work : 25 Marks
Practical : 25 Marks
Oral : 25 Marks

I. Distributed Computing :

Fundamentals, what is Distributed Computing ? Evolution of DCS, DC System Models, Advantages and Disadvantages of DCS, Comparison with Centralized OS, Network Concepts for distributed Computing : Data Link Layer Protocol, Network Layer Protocol, Transport Layer Protocol, Application Layer Protocol, Protocols for Distributed Systems, ATM Technology, Message Passing, Inter Process Communication, Issues in IPC, Synchronization, Buffering, Multigram Messages, Encoding & Decoding of Message Data, Process Addressing, Failure Handling. Remote Procedure Calls, RPC Models, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshalling Arguments & Results, Server Management, Communication Protocol for RPC's, Client-Server binding, Introduction to CORBA, CORBA Overview, BOA & POA Generation, Evaluating BOA & POA Generation, Lifecycle of a CORBA Invocation.

II. Management of Networks :

Introduction, History of Network Developments, Network Hardware, Network Software, OSI Reference Model (7 Layers), TCP/IP Reference Model, Queuing – Markovian Process.

The Physical Layer. The Theoretical Basis for Data communication : Fourier Analysis, etc. Transmission Media, Narrowband ISDN, Modulation, Multiplexing, Packet Switching, Circuit Switching.

The Data Link Layer, Data Link Layer design issues, Error detection & correction, Elementary Data Link Protocols, X.25 Protocol, Sliding Window protocols, Medium Access Sublayer, The channel Allocation Problem, ALOHA, Carrier Sense Multiple Access Protocols, Ethernet, Token bus and Token Ring (IEEE Standard 802 for LANs and MANs).

The Network Layer, Network Layer Design Issues, Routing, Types of Routing, Shortest Path Routing, General Principles of Congestion control, Network Layer in the Internet, The IP Protocol, IP Addresses, Subnets, Internet Control Protocols, OSPF, BGP.

The Transport Layer, The TCP Service model, The TCP Protocol, The TCP Segment Header, TCP Connection Management, TCP Transmission Policy, TCP Congestion Control, Timer Management. The Application Layer, DNS, SNMP, SNMPv2.

Network Management, Functions of Networks, Network Environments, Design Considerations, Performance, Monitoring Fault Management, Maintenance, Security, Administration.

Recent Development in Network, Mobile Communication, Satellite Communication, Fiber Optics as a Communication Media ATM, Types of Services in ATM, Hubs, Gateways, Bridges etc.

References :

1. Computer Networks (*Andrew S. Tanenbaum*) Pearson Education.
2. Distributed Operating Systems (*P. K. Sinha*) IEEE Press
3. Networks for computer scientists (*Youlu Zheng/ Shakil Akhtar*) Oxford University Press.
4. Distributed Operating Systems (*Andrew S. Tanenbaum*) Pearson Education
5. "Data and Computer Communication" (*Stallings*) Pearson Education
6. "Computer Networks and Internets" (*Douglas E. Comer*) 4th edition, Pearson.
7. "Data Networks" (*Bertseakas and Galleger*) Pearson Education.

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Principles of Communication Engineering

SYLLABUS

Time : 3 Hrs. **Theory :** 100 Marks

Term Work : 25 Marks

1. **Basic Communication Systems :**
   Basic block diagram of communication systems. Types of communication channels and their characteristics. Frequency / Spectrum allocations and their application areas. International standards for communication systems and frequency assignment. Wireless communication systems. Satellite communication systems. Optical fiber communication systems.

2. **Spectrum and Noise :**
   Fourier transforms, properties, energy and power density spectrum and applications. Sources of noise – Active and passive device noise, Noise parameters like S/N ratio, Noise factor, Noise figure, noise factor of cascaded network, Noise temperature and Noise bandwidth of system.

3. **Amplitude modulation Techniques :**
   AM–FC spectrum, bandwidth, power calculations and block diagrams of Low level and High level modulator. (No circuit level description). AM–SC spectrum, bandwidth, waveforms, generation methods, Circuits of Balanced modulator and Ring modulator. SSB–SC spectrum, bandwidth, waveforms, generation methods like Filter method, Phase shift method and third method. ISB with and without Pilot carrier.

4. **AM Receivers :**
   AM detectors – diode detector, envelops detector and their limitations. TRF Receiver, Super heterodyne Receiver and Double Conversion Receiver (only Block diagram approach). Receiver parameters – sensitivity, selectivity, fidelity, SINAD and types of distortion. Image frequency and its rejection and double spotting. Principle of AGC and types of AGC. Product demodulator and Balanced demodulation of DSBSC.

5. **FM transmission and reception**
   Principle of FM–waveforms, spectrum, bandwidth. FM generation – Direct FM and Indirect FM. Principle of AFC. FM demodulation – foster seely discriminator, Ratio detector and FM detection using PLL (only using Block diagram of PLL). FM super heterodyne Receiver block diagram with waveforms. Pre emphasis and de emphasis in FM, FM noise triangle. Comparison of AM and FM systems.

6. **Pulse Modulation Techniques**
   Sampling theorem for low pass signals with proof, anti aliasing filter. PAM, PWM and PPM techniques (only block diagram and waveforms). Sources coding methods like PCM, DPCM, DM and ADM (only block diagram and waveforms). Companding in PCM, Compounding laws. Basic digital Transmission methods – ASK, FSK and PSK with block diagram and waveforms.

7. **Multiplexing Techniques :**
   FDM and FDMA, TDM and TDMA, Standard FDM and TDM systems (only block diagrams and waveforms), Applications in satellite communication, optical communication and wireless communication.

References :

1. Communication systems engineering (*John G. Proakis*) Masond Saleim (Pearson education)
2. Digital and Analog Communication Systems (*Leon W. Couch*) 2nd edition
3. Modern Digital and Analog Communication Systems (*B. P. Lathi*) Third Edition, Oxford University press.

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