K L University
Department of BIO - TECHNOLOGY
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

Bioprocess Engineering

UNIT–I: Introduction to Bioprocess

An of overview of traditional and modern applications biotechnology industry, outline of an integrated bioprocess (upstream and downstream) with process flow sheet,steps in development of a complete bioprocess for commercial manufacture of recombinant-DNA derived product. -9 hrs

UNIT– II: Dimensions and system units

Basic Biochemical Calculations: atomic, molecular and equivalent weights. Molarity,Molality,Normality and partial pressures,laws of chemical combination, Definition ofstochiometry, Composition of mixtures and solutions, weight fractions, volumetriccomposition, Density and Specific gravity -9hrs 2

UNIT –III: Fermenation and Enzyme Processes

Aerobic and Anaerobic fermentation processes and their application in the biotechnology industry behavior of microbes in different reactors (air lift, batch,continuous ,fed batch condition). Production of enzymes in submerged and solidstate processes, extraction and purification of enzymes, methods of characterization,specific activity and activity definitions. -9hrs

UNIT–IV: Metabolic Stoichiometry and Energetics

Stoichiometry of cell growh and product formation; Elemental balances; degree of reduction of substrate and biomass.available electron balance; yield coefficients of biomass and product formation, maintenance coefficients, Energetic analysis of microbial growth and product formation; thermodynamic efficiency of growth -9hrs

UNIT – V: Kinetics of microbial growth and Product formation

Phases of cell growth in batch cultures, Simple unstructured kinetic models formicrobial growth, Monod model, Growth of filamentous organisms. Growthassociated (primary) and non-growth associated (secondary) product formation Kinetics. Leudeking-Piret models. -9hrs

Books:

(I) Textbook:
1. D.G.Rao, Introduction to Biochemical Engineering, McGraw-Hill, 2005.
2. Pauline and Doran , Bio Process Engineering Principles , Elsevier
(ii) Reference Book:
1. Bailey Ollis, Biochemical Engineering fundamentals, 2nd edition,
McGraw-Hill, 1986.
2. M.L.Shuler and F. kargi Bioprocess engineering, Prentice Hall of
India 1992

BIOPROCESS ENGINEERING

Model Question Paper

Time: 3 Hrs Max.Marks:100

Answer any five questions. All questions carry equal marks

1. Disscuss in brief about the outline of a integrated bioprocess with a process flow sheet

2. Production of Single Cell-Protein from hexadecane is described by the following equation

$$C_{16}H_{34} + a\,O_2 + b\,NH_3 \longrightarrow CH_{1.66}O_{0.27}N_{0.20} + dCO_2 + e\,H_2O$$

Where $CH_{1.66}O_{0.27}N_{0.20}$ represents the biomass if RQ=0.43, determine the stiochiometric coefficients

3. Discuss the production aspects of Cellulase and Xylanase using solid state fermentation .Differentiate between Solid state fermentation and submerged fermentation

4. Define the following

   I. Available electrons

   II. Degree of reduction

   III. Theoretical O_2 demand

   IV. Yield coefficient

5. Discuss the application of leudeking –piret model for a primary metabolite

6. Discuss a simple Unstructured kinetic model for microbial growth

7. Elucidate the growth kinetic aspects of steady state and unsteady state conditions in Continuous, fed batch and Batch Cultures.

8. Discuss the production of bacterial amylases and their characterization of kinetic parameters

BIOANALYTICAL TECHNIQUES

SYLLABUS

Unit I: ***Spectroscopy Techniques***

Buffers; Methods of cell disintegration; Enzyme assays and controls; Detergents and membrane proteins; Dialysis, Ultrafiltration and other membrane techniques UV, Visible and Raman Spectroscopy; Theory and application of Circular Dichroism; Fluorescence; MS, NMR, PMR, ESR and Plasma Emission spectroscopy

Unit II: ***Chromatography Techniques***

TLC and Paper chromatography; Chromatographic methods for macromolecule separation – Gel permeation, Ion exchange, Hydrophobic, Reverse-phase and Affinity chromatography; HPLC and FPLC; Criteria of protein purity

Unit-III: ***Electrophoretic techniques***

Theory and application of Polyacrylamide and Agarose gel electrophoresis; Capillary electrophoresis; 2D Electrophoresis; Disc gel electrophoresis; Gradient electrophoresis; Pulsed field gel electrophoresis

Unit IV : ***Centrifugation***

Basic principles; Mathematics & theory (RCF, Sedimentation coefficient etc); Types of centrifuge - Micro centrifuge, High speed & Ultracentrifuges; Preparative centrifugation; Differential & density gradient centrifugation; Applications (Isolation of cell components); Analytical centrifugation; Determination of molecular weight by sedimentation velocity & sedimentation equilibrium methods.

Unit V: ***Advanced Techniques***

Protein crystallization; Theory and methods; API-electrospray and MALDI-TOF; Mass spectrometry; Enzyme and cell immobilization techniques; DNA & Peptide Synthesis and sequencing.

Texts:

1. Freifelder D., Physical Biochemistry, Application to Biochemistry and Molecular Biology, 2nd Edition, W.H.
2. Freeman & Company, San Fransisco, 1982.
3. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 5th Edition, Cambridge University Press, 2000.

References

1. D. Holme & H. Peck, Analytical Biochemistry, 3rd Edition, Longman, 1998.
2. R. Scopes, Protein Purification - Principles & Practices, 3rd Edition, Springer Verlag 1994.

BIOANALYTICAL TECHNIQUES

Model Question Paper

Maximum marks: 100 Time: 3 hours

Answer any five questions from the following representing at least one from each unit.
Each question carries 20 marks.

1. Outline the physical, Chemical and Mechanical procedures that could be of interest in the disintegration of cells.

2. With the help of a neat and labeled sketch explain the principle and applications of HPLC.

3. Differentiate between preparative and analytical centrifugation and thereby explain the construction and working of an analytical ultracentrifuge.

4. List the various components necessary for an electrophoretic set up and then describe the process involved in separation of plasma proteins by 2D electrophoresis..

5. Describe in detail MALDI- TOF.?

6. Explain the following with reference to Nucleic acids (2X10=20)

    A. Stationary and mobile phases in Chromatographic techniques

    B. Density gradient centrifugation.

7. Outline the principle, instrumentation and applications of mass spectrometry in peptide sequencing.

8. Outline the theory and explain the principle and application of Circular Dichroism.

PLANT BIOTECHNOLOGY

SYLLABUS

Scope – This course helps in an in-depth understanding of basic and advanced techniques in Plant biotechnology.

Unit-1 : An Overview of Plant Biotechnology

Totipotency, Media, types of media used, media composition, nutritional variations, cell nutrition, cytodifferentiation, invitro growth parameters, contamination and recalcitrance, invitro cultivation methods, molecular farming.

Unit – 2: Organogenesis, Caulogenesis and Rhizogenesis

Descriptive understanding of invitro grown plantlets showing disease- resistant, herbicide tolerant and induction of environment sustainance. Direct and indirect methods of regeneration Suspension cultures,Somaclonal and gametoclonal variations and Genetic stability

Unit - 3 : Secondary Metabolite production & Germplasm conservation

Plant secondary metabolites, commercial production using appropriate media supplements viz., elicitors, growth factors, stress factors, defense proteins, precursors and anti-metabolites. Cryo preservation exsitu and insitu methods, freezing, thawing and drying and cryoprotectors.

Unit – 4: Genetic Transformation & Molecular breeding

Protoplast isolation, culture and fusion technique, protoplast induced transformation, Target cells for transformation, methods of gene transfer, selectable marker genes, reporter genes, screenable genes, Agrobacterium mediated transformation, histo chemical assay,transgenic plants, Plant DNA finger printing, RAPD, RFLP, PCR studies in plants with a focus on molecular assisted selection.

Unit – 5: Plant Bioinformatics

New approaches to scientific research with computers, Information and communication technologies (ICT model systems), genomics (functional and structural), proteomics, molecular bioinformatics, chemi informatics and their applications in Plant improvement.

PLANT BIOTECHNOLOGY

Model Question Paper

Answer any Five questions 5 x 20 = 100

(Draw diagrams wherever necessary)

1. Give a detailed account of invitro growth parameters adopted during molecular farming?

2. Enumerate the conceptual idea of genetic stability with a focus on cell culture systems?

3. Describe the methodology of secondary metabolite production using plant bio reactors?

4. Write short notes on the following:

    a. Cryo preservation b. Thawing c. Drying

5. Explain the protocol for agrobacterium – mediated transformation.

6. Write a note the following:

    a. Reporter genes b.Marker genes c. Histochemical assay

7. Explain the applications of PCR in plant improvement.

8. Elucidate the role of different ICT model systems used in crop improvement?

MICROBIAL TECHNOLOGY

Unit 1. Microbial Diversity

Tools and techniques of microbial diversity, culturables and non culturables, metagenomics

Unit - III: Production of Primary Metabolites, Enzymes

A brief outline of processes for the production of some commercially important Organic acids (e.g., Citric acid, Lactic acid , Acetic acid, Gluconic acid); Amino acids (Glutamic Acid, Lysine, Aspartic Acid and Phenylalanine); and Alcohols (Ethanol, 2,3-butanediol) secondary metabolites: Antibiotics-beta-lactams (Penicillin's), aminoglycosides (Streptomycin), Macrolids (Erythromycin), Quinines and aromatics. Vitamin B12 and steroids, Enzymes

Unit IV: Production of Recombinant Proteins, Special bioproducts

Production of Recombinant Proteins- Insulin and Special Bioproducts- Biopesticides; Biofertilizers Natural Biopreservatives (Nisin); Biopolymers (Xanthan Gum, EPS); process of bioleaching; bioremediation; Probiotic and food applications

UNIT V: Fermentation

Fermentation Microbial Growth and Death Kinetics; Media for Industrial Fermentation; media optimization; Air and Media Sterilization; Types of fermentation processes - Analysis of batch, Fed-batch and continuous bioreactions, bioreactors, specialized bioreactors (pulsed, fluidized, photobioreactors etc. Concept of SSF, down stream processing, product recovery

Unit - II: Screening and Strain improvement techniques

Primary and Secondary screening. Strain improvement by Physical, Chemical and Molecular techniques. Emerging techniques (genome shuffling etc), screening techniques, high throughput screening, food grade technologies, GMO (including labeling, release, identification), metabolic pathway engineering

Suggested Readings

1. Molecular Biotechnology: Principles and Application of Recombinant DNA3rd edition, B.R. Glick & J.A. Pasternak, 2005.

2. Microbial Biotechnology, Glazer AN, Nikaido H, WH Freeman and Company, (1995).

3. General Microbiology, Stainer RY, Ingraham JL, Wheelis ML. & Painter PR. The Macmillan Press Ltd., (2000).

4. Microbiology-Principles and exploration, Black JG, Prentice Hall, (1999).

5. Microbial Biotechnology, Glazer AN, Nikaido H, WH Freeman and Company, (1995).

6. Biochemical Engineering Fundamentals (2nd ed), JE Baily & DF Ollis, McGraw Hill Book Co. New York. 1986.

7. Bioprocess Technology: Fundamentals and Applications, KTH, Stockholm. 2000.

8. Principles of Fermentation Technology (2nd edition), PF Stanbury, A Whittaker and SJ Hall, Pergamon Press, Oxford. 1995

MICROBIAL TECHNOLOGY

Answer any five. All questions carry equal marks.

1. Describe the emerging strain improvement methods.

2. Describe Metagenomics and its applications.

3. Discuss case of Metabolic Engineering.

4. What are food grade technologies?

5. What are probiotics?

6. Describe the different fermentation types.

7. Give process outlines for production of primary metabolites by microorganisms.

8. Describe the application of rDNA technology for microorganisms.

MICROBIOLOGY

SYLLABUS

UNIT – I: HISTORY AND CLASSIFICATION OF MICROORGANISMS

Discovery of microorganisms; Theory of spontaneous generation, Germ theory of disease; Microbial taxonomy and diversity: Bacteria and their broad classification - Major characteristics used in taxonomy. Major contributors in field of Microbiology - Antony van leeuwenhoeks; Louis Pasteur; Robert Koch; Edward Jenner; Joseph Lister; Winogradsky; Beijerinck.

UNIT-II: MORPHOLOGY & CELL STRUCTURE OF MICROORGANISMS

Ultra structure of bacteria, cell wall, flagella, pili, capsule, endospore and cell inclusions. Viruses – Chemistry & Morphology (size, shape and symmetry), replication of viruses, lytic and lysogenic cycles. Yeasts & Molds – Morphology, life cycle, economic importance of fungi (Eg. Aspergillus). Identification based on shape, staining reactions (Differential stain, Acid fast, capsule staining, Endospore staining).

UNIT – III: GROWTH KINETICS OF MICROORGANISMS

Bacterial nutrition- Nutritional classification of bacteria, Essential Macronutrients, Micronutrients and Growth factors. Microbial growth **–** Growth curve and factors affecting the growth – solutes, water activity, pH, Temperature, Oxygen concentration, Osmotic pressure, Radiation. Bacterial growth; synchronous growth and methods of growth estimation. One step growth curve, Physiology of Archaebacteria – thermophiles, psychrophiles, halophiles and methanogens.

UNIT –IV: GROWTH MEDIA AND CONTROL OF MICROORGANISMS

Culture media - synthetic and complex media, solidifying agents, types of media. Isolation of pure cultures - spread, pour and streak plate methods; Maintenance and Preservation of microorganisms. Control of microorganisms – Sterilization and disinfection, effects of physical (moist and dry heat, radiation and filtration) and chemical agents. Antibiotics – classification, mode of action and resistance.

UNIT – V: MEDICAL MICROBIOLOGY

Disease reservoirs; Respiratory infections caused by bacteria and viruses, (tuberculosis); Disease transmitted by animals (rabies) and insects (malaria); Food and water-borne diseases (cholera); pathogenic fungi, Viriods& Prions.

Recommended Texts books:

1. Pelczar MJ, Chan ECS & Krieg NR, Microbiology Tata McGraw Hill.

2. Prescott & Dunn by **General Microbiology**- McGraw Hill publishers.

References Books: 1. C.B.Power. General Microbiology Vol I & II

2. Brock, **Biology of microorganisms** Prentice Hall Int.Inc.

MICROBIOLOGY

Answer any FIVE from the following questions: 5 X 20 = 100 marks

1. Give a detailed account on contributions of Louis pastuer for microbiology development?

2. Write brief notes on:

a)water borne diseases b) Viriods and prions

3 Write a note on fungi general characters and economic importance?

4. Write in detail about growth estimation methods

5. Write a brief note on following

a) Preservation of microorganisms b) types of media

6. Explain in detail about physical sterilization methods

7. Discuss various stages of lytic and lysogenic cycles of viruses?

CANCER BIOLOGY

SYLLABUS

UNIT I – CHARACTERISTICS OF HUMAN CANCER

Defintion and Description of cancer, Basic facts about cancer, classification of human cancers, Macroscopic and microscopic features of neoplasms, Tumor staging. Basic feature of normal cell & tissues. Characteristic features of tumour cells. Control of growth in normal cells, Factors influencing the development of cancers, Nomenclature of tumour cells, Effect of cell receptors.

UNIT II : ONCOGENES AND TUMOR SUPPRESSOR GENES

Oncogenes - Historical Perspectives, The provirus, protovirus,and oncogene hypothesis, The src gene, Oncogene Families, Cell Transforming Ability of onc Genes, Functional Classes of Oncogenes, Characteristics of Individual Oncogenes-*ras, myc, src, jun and fos, ets, bcr-abl, myb, bcl-2,NF-kB/rel, erbA, sis, erbB, erbB-2 (Her-2/neu),* Other growth factor or growth factor receptor oncogenes-*fms, kit, trk,met , Pokemon*. Cellular onc Gene Expression during Normal Embryonic Development. DNA Tumor Viruses-*SV40 and Polyoma , Papilloma Viruses E6 and E7, Adenoviruses E1A and E1B, Hepatitis B Virus, Herpes Viruses*

Tumor Suppressor Genes-Historical Perspectives,Properties of Individual Tumor Suppressor Genes- **rb** Characterization of the rb protein, Interactions of Rb proteins, Role of rb in reversing the malignant phenotype, Requirement of a functional rb-1 gene in development, Cell cycle regulation by Rb ,Interactions of Rb protein with transcription factors and DNA regulatory elements. **p53** - Characteristics of p53 and its mutations, Mutagenesis of p53, Ability of p53 to reverse cellular transformation and tumorigenesis, Role of p53 in cell cycle progression and in inducing apoptosis, Mechanism of p53's actions. Wilms' tumor suppressor gene wt-1,Adenomatous polyposis coli (apc) gene, Deleted in colorectal cancer (dcc) gene, Hereditary nonpolyposis colorectal cancer (hnpcc) gene, Neurofibromatosis genes nf-1 and nf-2 , Von Hippel-Lindau syndrome and renal cell carcinoma gene, BRCA1 and BRCA2, Identification of Tumor Suppressor Genes. Mechanisms of Gene Silencing-Antisense, Ribozymes, DNAzymes, RNAi, Transitive RNAi, Micro-RNA, Small temporal RNA, Short hairpin RNA

UNIT III : MOLECULAR GENETICS OF CANCER

Chromatin Structure and Function- Components of Chromatin, Chemical Modifications of Chromatin-Associated Proteins Packaging of Chromatin, Structure and Function of Interphase Chromosomes, Nuclear Organization, Nuclease Sensitivity, Transcriptional Activation and the Cancer Connection, Control of Gene Expression during Embryonic Stem Cell Differentiation, Split Genes and RNA Processing, Genetic Recombination, Gene Amplification, Cis-Acting Regulatory Elements: Promoters and Enchancers, Transcription Factors, Structural Motifs of Regulatory DNA-Binding Proteins, Repressors, General (Basal) Transcription Factors, Promoter- and Enhancer-Specific Transcription Factors- AP-1/Fos/Jun, ATF/CREB, SP1 290, Oct-3, The superfamily of hormone receptors, YY1 291, LEF-1 291, E2F 291. Tissue specific transcription factors- MyoD, Liver specific transcription factors, Pit-1, E2A,NF-kB, POU-domain binding proteins, Ets1 and Ets2,Homeobox proteins.

DNA Methylation - DNA Methyltransferases, Methyl DNA Binding Proteins, DNA Methylation and Cancer. Genomic Imprinting, Loss of Heterozygosity, Telomeres and Telomerase,Post-transcriptional Regulation.

Molecular genetic alternations in cancer cells- Translocations and inversions, chromosomal deletions gene amplification, point mutations, Aneuploidy, Disomy, trinucleotide expansion, microsatellite instability, mismatch DNA repair defects, Gene Derepression in Cancer Cells.

UNIT IV : TUMOR IMMUNOLOGY

Historical Perspectives, Mechanisms of the Immune Response to Cancer, Antigen Presenting Cells, How

Antigens Are Processed T Lymphocytes and T Cell Activation, The Immunological Synapse, B Lymphocytes and B Cell Activation, Natural Killer Cells, Cell-Mediated Cytotoxicity, Danger Theory, Role of Gene Rearrangement in the Tumor Response, Heat Shock Proteins as Regulators of the Immune Response, Inflammation and Cancer, Immunotherapy, Rationale for Immunotherapy, Identification and Characterization of Tumor-Derived Antigenic Peptides, Cytokines, Interferons, Interleukins, Tumor necrosis factor, Adoptive Immunotherapy, Vaccines, Monoclonal Antibodies, How Tumor Cells Avoid the Immune Response.

UNIT V : CANCER DIAGNOSIS

Medical and Scientific Drivers for Expanded Cancer Diagnostic Techniques, Categories of Tumor Markers, Nucleic Acid-Based Markers, Cancer-associated mutations, Loss of heterozygosity and microsatellite instability, DNA methylation patterns, Mitochondrial DNA mutations, Viral DNA, Gene Expression Microarrays, Laser-Capture Microdissection, Comparative Genome Hybridization, Tissue Arrays Gene Expression Microarrays in Individual Cancer Types-*Lymphoma, Leukemia ,Breast cancer , Ovarian cancer, Prostate cancer, Colorectal cancer, Lung cancer, Renal cancer, Hepatic cancer, Other cancers and cancer-related phenotypes.* **Proteomics -** Proteomics Methods, Two-dimensional electrophoresis, Isotope-coded affinity tags (ICAT), Mass spectrometry-based proteomics, Protein chips, Surface-enhanced laser desorption/ionization (SELDI), Yeast two-hybrid system, Phage display, Organelle proteomics, Plasma proteome, Tissue proteomics: imaging mass spectrometry, Pattern recognition, The unfolded protein response. **Proteomics in Cancer Diagnosis** - *Lung cancer, Ovarian cancer, Breast cancer, Prostate cancer, Pancreatic cancer.*

Recommended Textbooks:

1. Ruddon, R.W., 2007. Cancer biology. Oxford University Press, USA.
2. Cancer Biology – Roger.G.B. Prentice Hall (May 2006).
3. Margaret A Knowles and Peter. J. Shelly, Introduction to Molecular and Cellular Biology of Cancer. 4th Edition.
Elsevier publications.

References Books:

1. Introduction to modern virology – Dimmock N.J., Blackwell scientific Publications. Oxford.
2. An Introduction to Cellular and Molecular Biology of Cancer – Oxford Medical Publications.
3. Kenneth M. Murphy, Paul Travers, Mark Walport,
4. Janeway's Immunobiology, 7th Edition, Garland Science Taylor &Francis Group

CANCER BIOLOGY

Model Question Paper

Time:3hrs Max Marks :100

Answer any five questions (5 x 20 = 100 marks)

1. Describe various morphological, cellular, genetic and molecular features of tumour cells that would help in differentiating them from normal cells.

2. What is the difference between an oncogene and a tumor-suppressor gene? Give some examples of functions of proto-oncogenes and tumor suppressors in normal cells?

3. Explain how chromosome deletions, inversions and translocations may cause cancer, with suitable examples?

4. Explain the epigenetic changes in cancer induction and progression?

5. Genes in cancer cells are frequently amplified, meaning that the gene exists in many copies. Would you expect to see gene amplification in oncogenes, proto-oncogenes, or both? Explain your answer.

6. Explain the tools and techniques of proteomics used in breast cancer diagnosis?

7. Explain the mechanisms whereby tumor cells avoid the immune response?

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BASIC ORGANIC CHEMISTRY

UNIT I

Purification and drying of organic solvents Benzene, toluene, xylene, Tetrahydrofuran, chloroform, dichloromethane, methanol, dimethyl formamide, dimethylsulfoxide,

UNIT –II

Preparation of Reagents: Sodium methoxide, TMEDA-$ZnCl_2$ Complex, Lithium diisopropylamide, Butyl Lithium, organomagnesiumhalide, wittig reagent, sodamide, dialkyllithiumcuprate. Oxidising agents, Reducing agents.

UNIT-III

Reactive intermediates Carbanions, carbocations, carbenes, carbon radicals, nitrenes, arynes,

UNIT-IV

Named reactions and rearrangements Benzoin condensation, Perkin reaction, Cannizaro reaction, Diels Alder reaction, Heterodiels alder reaction, Peterson olefination, Wolf Kishner reduction, Claisen rearrangement, Cope rearrangement, Oxycope rearrangements, Benzidine rearrangement, Beckman rearrangement.

UNIT- V

Chromatographic techniques: Principles & applications with respect to Thin-Layer chromatography, Paper chromatography, Column chromatography, Gas Chromatography and HPLC with suitable examples & Chromatograms

BASIC ORGANIC CHEMISTRY

Model Question Paper

Note: a) Answer **ANY 5** of the following: Max. Marks: **100**

b) Each question carries **20** marks

1. Describe the purification techniques of Tetrahydrofuran, chloroform, dichloromethane, dimethyl formamide, dimethylsulfoxide.

2. Prepare the following reagents by the use of conventional methods:

(a) TMEDA-$ZnCl_2$ Complex (b) Butyl Lithium (c) Grignard reagent (d) wittig reagent (e)sodamide.

3. (i) Explain the formation of states in the Carbenes.

(ii) Compare the geometrical features of carbocation and carbon radical.

4. Expalin the following conversions with its mechanism.

(a) Benzophenone to Benzanilide (b) Benzaldehyde to benzoic acid and benzyl alcohol.

(c) N,N'-diarylhydrazines to 4,4'-diaminobiaryl compound.

(d) 4-hydroxy-1,5 hexadiene to 5-Hexenal.

5. Write the principle and the procedure involved for the following techniques:

(i)Column chromatography (ii) Gas Chromatography.

6. Discuss the following:

(a) Participation of Nitrene in aryl ring expansion and contraction.

(b) Preparation, properties and reactions of arynes.

7. (a) write the preparation and properties of Pyridinium Di Chromate and Pyridinium Chloro Chromate.

(b) How Peterson olefination reaction useful in the synthesis of organic compounds.

8. (a) How do you distinguish the Chromatographic techniques of HPLC and TLC.

(b) Write the preparation of Carbanions by using LDA and Sodamide and how you will develop C-C single bonds.

ADVANCES IN ORGANIC CHEMISTRY

Unit-I

Structural Elucidation by Spectroscopic Methods: Application of UV, IR and NMR spectroscopy, mass spectroscopy in structural analysis of organic compounds.

Unit-II

Oxidation: Oxidation of hydrocarbons; alkenes, alcohols, aldehydes and ketones Oxidative coupling reactions. Use of $Pb(OAC)_4$, NBS, CrO_3, SeO_2, MnO_2, $KMnO_4$, OsO_4, Per acids and Ti(III) Nitrate.

Reduction: Catalytic hydrogenation (homogenous and heterogeneous), reduction by dissolving metals, reduction by hydride transfer reagents, reduction with hydrazine and diamide

Unit-III

Disconnection approach: Introduction, Principle, Functional group inversion, Disconnection of mono cyclic substituted organic Compounds.

Unit-IV

Phase Transfer catalyst: Principle & applications of three catalysts: Tetra butyl Ammonium bromide, Crown ethers, Ethyl Triphenyl Phosphonium Bromide.

Unit- V

Design Organic Synthesis: Retro synthesis the disconnection approach – basic Principles Convergent and linear synthesis with examples; Retro synthesis of bi cyclic and tri cyclic systems.

ADVANCES IN ORGANIC CHEMISTRY

Model Question Paper

Note: a) Answer **ANY 5** of the following: Max. Marks: **100**

b) Each question carries **20** marks

1. Write mechanism for the following reactions:
   a) Beckmann rearrangement b) Favorski reaction

2. Discuss the following:
   (a) Lithium alluminium hydride in Ether.(b) Sodium in liquid Ammonia.

3. (a) A compound has a molecular weight 86 and gives a peak in its IR spectrum at 1726cm^{-1}. ^{1}H NMR data (ppm): 0.9ppm (triplet, 3 H), 1.4 ppm (sext, 2H,), 1.6ppm (pent, 2H), 2.4ppm (tri, 2H), 9.7ppm (sing, 1H) Propose a structure for the above data.

   (b) Mc.Lafferty Rearrangement.

4. (a)How spin-spin splitting takes place in ^{1}H NMR spectroscopy?

   (b) Discuss various types of couplings in ^{1}H NMR spectroscopy?

5. Write the important applications of phase transfer catalyst?

6. Write the role of the following reagents in organic reactions:

   $Pb(OAC)_4$, NBS, $KMnO_4$, OsO_4 and Ti(III) Nitrate.

7. Write a note on disconnection approach?

8. How the following molecules are synthesized?
   a) P-nitro aniline from benzene
   b) Compare the Oxidising nature of NBS and Selenium Di Oxide

ANALYTICAL CHEMISTRY

Unit- I : Basic separation techniques- I:

Theory and Techniques of distillation, fractional distillation, steam distillation, vaccum distillation,Molecular distillation and sublimation. Theory of action of drying agents, Fractionation by evaporation-working of Rotory film evaporator. Extraction – Distribution law and derivation, solvents and their choice. tenchniques – batch and continuous, multiple extraction, column and their choice.

Unit-II: Basic separation techniques -II:

Complexation-Theory and application of complexating agents and choice Dialysis – Theory, membranes and their choice, techniques and applications. Ultrafilteration and zone filteration – principles and techniques Centrifugation –Principle, Techniques , Ultra centrifuge-description of apparatus, theory, sedimentation velocity and molcecular weight determination.

Unit-III: Basic chromatographic techniques:

Chromatographic methods- theroy, principle, classification and mechanism-adsorption, partition, ion exchange, ion association, gel permeation and molecular sieving

Column chromatography – Construction and operation of column, choice of adsorbents and eluents, techniques of elution, methods of detection, analytical and industrial applications.
Paper chromatography – Construction and operation of column, choice of separation, types of papers and their choice, different techniques, qualitative measurements, source of errors in analytical and industrial applications.
Thin Layer chromatography – Techniques and applications, Modified stationary phases.
Ion – exchange chromatography – Techniques and applications.

Unit-IV: Advanced chromatographic techniques:

Gas chromatography – Types and nature of stationary and mobile phase, solid supports and their choice, columns – packed, open and capillary, sampling methods instrumentation, detectors – types sensitivity, limits of detection operative principles of TCD, FID and ECD, Comparison of detectors temperature programming, derivative chromatography, hyphenated techniques with GSGC qualitative and quantitative applications.

(P.T.O)

Gel permeation chromatography – Instrumentation, heterogeneity factor, determination of molecular weights - weight average and number average, analytical and industrial applications.

Liquid chromatography – High pressure liquid chromatography. Theory and equipment, type of pumps and their choice, types of columns, large scale separation, application in analytical chemistry and in industry.

Unit-V: Advanced analytical tools:

New development in chromatography – Plasma chromatography, super critical fluid chromatography.
Electrophoresis-Theory and classification, factors affecting mobility, macromolecular size and charge interactions with supporting electrolyte, pH and concentration discontinuities, Factors affecting electrophoresis phenomena-electrolysis, electrosomosis, temperature and supporting media. Instrumentation, methodology, Preparation of gel- staining and destaining, preparative zone electrophoresis, continuous electrophoresis and Applications.

ANALYTICAL CHEMISTRY

Model Question Paper

Answer any **FIVE** of the following.

Each Question carries 20 marks

1. a) Write the role of solvents in extraction techniques
b) Discuss the principle and working of Rotory film evaporator and its applications

2. a) Write about complexation in separation process
b) Explain the principle, working and types of centrifugation methods

3. a) Give details about working of i) adsorption Chromatography ii)ion exchange Chromatography
b) Explain the following terms:
    i) fractional distillation
    ii) sublimation
    iii) steam distillation

4. Explain the principle, working and instrumentation of Gas chromatography

5. Discuss the theory, types of columns and applications of HPLC in analytical chemistry

6. Write theory, types of electrophoresis techniques. How do you separate various aminoacids?

7. a) Derive distribution law and discuss the techniques in multiple extraction.
b) What is gel permeation chromatography? Explain the heterogeneity factor.

8. a) Write notes on super critical fluid chromatography.
b) Write note on:
    i) TCD
    ii) FID
    iii) ECD

ADVANCED INSTRUMENTAL METHODS FOR CHEMICAL CHARACTERIZATION AND ANALYSIS

UNIT-1: **Absorption Spectroscopy:**

Introduction and importance; Principles and instrumentation; Interferences - Chemical & Spectral and evaluation methods; Applications of Atomic Absorption Spectroscopy for qualitative and quantitative analysis.

UV-Visible spectroscopy: Theory, Rules and identification of functional groups

Chiroptical spectroscopy-CD, ORD curves, applications to organic molecules. Problems related to UV and ORD curves.

UNIT-2: IR, FT-IR and Raman spectroscopy:
Introduction; basic principles; Instrumentation; Detectors, Qualitative, Quantitative analysis and Applications. Raman spectroscopy –identification of some organic functional groups. Solving some problems related IR and Raman spectroscopy.

UNIT-3: Nuclear magnetic resonance spectroscopy:
High resolution NMR – chemical shift- Spin-Spin splitting (j-value) Spin decoupling ; spin tickling, shift reagents; structure determination, applications of proton NMR and problems ^{13}C NMR –Principle, rules, applications and problems ^{2}D NMR – Principle, COSY (HETCOR, HOMCOR) DQFCOSY, DEPT, INEPT, NOESY, INADEQUATE, HMBC,HMQC and problems. P.T.O)

UNIT-4: Mass Spectroscopy and allied techniques:

Introduction; Basic principles, ionizing sources, types of ions, detectors and applications. Rules, modes of fragmentation of various organic molecules and problems. Principle and applications of GC-MS, HPLC-MS, GC-FTIR

UNIT-5: X-ray fluorescence and Thermal Analysis:

Principle, energy dispersive X-ray fluorescence, wavelength dispersive X-ray fluorescence, X-ray photo electronic spectroscopy, chemical shift, application of XPES and XRF. Principles, basic instrumentation and applications of TG, DTA and DSC. differential scanning calorimetry.Cyclic voltametry – Principle, instrumentation and applications.

ADVANCED INSTRUMENTAL METHODS FOR CHEMICAL CHARACTERIZATION AND ANALYSIS

Model Question Paper
Time:3hrs Max Marks:100
Answer any five of the following.
Each Question carries 20 marks

1. a) Explain the different electronic transitions in UV spectrum with suitable examples.
b) Define octant rule & explain giving one example, how this could be used for the determination of absolute configuration of an organic compound?

2. a) write note on finger print region and group frequency region?
b) Differentiate the following compounds by using IR Spectroscopy
OH and OOCH3

3. a) Explain the Anisotropic effect in Acetylene , Ethylene and Benzene?
b) Explain the temperature dependence spectra of cyclohexane and
N,N-dimethyl form amide ion?

4. a) What is Magnetisation transfer? Explain its Applications.
b) Explain the 2D–INADEQUATE Spectrum?
c) Explain the differences between Proton NMR and 2D-NMR?

5. a) Write note on off resonance decoupling and Noise decoupling in 13C Spectra? And also discuss the factors affecting the 13C Chemicals Shift detail?

6. a) Explain Spectral fragmentation in organic Compound?
b) Suggest the structure of the compound with molecular formula C10H12O whose mass Spectra shows peaks at m/z 15, 43, 91,105,148.

7. An organic Compound with molecular weight 108 shows the following spectral data:
IR: 3440, 3225, 3020,2920,1623,1290, and 810cm^{-1}
^{1}H NMR: 2.20(S, 3H) 3.29 (S, 2H), 6.42(d, 2H), and 6.85 (d, 2H).
Mass: 106, 91, 77. Deduce the Structure of the compound?

8. Discuss the scattering & diffraction of X-ray along with selection rules? And also discuss the photoelectric effect in X-ray diffraction studies?

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Department of CIVIL ENGG
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ADVANCED CONCRETE TECHNOLOGY

UNIT I

Materials- Cement, Aggregates, mixing water soundness of aggregate- Fresh and hardened concrete: Admixtures- types of admixtures- purposes of using admixtures- chemical composition- effect of admixtures on fresh and hardened concretes- Natural admixtures.

UNIT II

Non destructive evaluation: Importance- Concrete behavior under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods- Corrosion activity measurement- chloride content – Depth of carbonation- Impact echo methods- Ultrasound pulse velocity methods- Pull out tests.

UNIT III

Fibre reinforced concrete- Properties of constituent materials- Mix proportions, mixing and casting methods-Mechanical properties of fiber reinforced concrete- applications of fibre reinforced concretes.

Light weight concrete- Introduction- properties of light weight concrete- No fines concrete- design of light weight concrete.

UNIT IV

Flyash concrete- Introduction- classification of flyash- properties and reaction mechanism of flyash- Properties of flyash concrete in fresh state and hardened state- Durability of flyash concretes.

UNIT V

High performance concretes- Introduction- Development of high performance concretes- Materials of high performance concretes- Properties of high performance concretes.

Text Books:

1. Concrete technology- Neville & Brooks
2. Special Structural concrete- Rafat Siddique
3. Concrete repair and maintenance illustrated- Peter H Emmons
4. Concrete technology-M S Shetty

CONCRETE TECHNOLOGY

UNIT I CEMENTS & ADMIXTURES: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand –Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

UNIT – II FRESH CONCRETE: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT – III HARDENED CONCRETE : Water / Cement ratio – Abram's Law – Gelspaoe ratio – Nature of strength of concrete – Maturity concept – Strength in tension & compression – Factors affecting strength – Relation between compression & tensile strength - Curing.

TESTING OF HARDENED CONCRETE: Compression tests – Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Non-destructive testing methods – codal provisions for NDT.

UNIT – IV ELASTICITY, CREEP & SHRINKAGE – Modulus of elasticity – Dynamic modulus of elasticity – Posisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

UNIT – V MIX DESIGN : Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

SPECIAL CONCRETES: Light weight aggregates – Light weight aggregate concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Different types of fibres – Factors affecting properties of F.R.C – Applications – Polymer concrete – Types of Polymer concrete – Properties of polymer concrete – Applications – High performance concrete – Self consolidating concrete – SIFCON.

TEXT BOOKS:

1. Properties of Concrete by A.M.Neville – Low priced Edition – 4th edition

2. Concrete Technology by M.S.Shetty. – S.Chand & Co. ; 2004

REFERENCES:

1. Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi

2. Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi

ADVANCED DESIGN OF STRUCTURES

UNIT-I

Introduction: Analysis and design of portal frames, Design example for hinged and fixed frame.

UNIT-II

Reinforced concrete deep beams:
Introduction to Deep Beams Parameters influencing design; IS code provisions; design of simply supported and continuous beam

UNIT-III

Elevated water tanks: Introduction, Analysis & Design of INTZ Tanks including staging and continuous deep beams.

UNIT-IV

Earthquake resistant design: Concept of Earthquake resistant design, provisions of seismic code IS 1893 (Part-I), Response spectrum, Design spectrum, Design of buildings, Reinforcement detailing, Provisions of IS 13920

UNIT-V

Introduction to plastic analysis: stress strain relationship of Mild steel, Elastic design versus Ultimate load design, Plastic bending of beams, Shape factor, Load factor, Plastic analysis, Procedure for plastic analysis, Design consideration

Text Book:

Advanced Reinforced Concrete Design, by N.Krishna Raju, CBS publishers, 2009.

Reference Books:

1. Advanced Reinforced Concrete Design by Varghese,Pentice Hall India, 1st edition 2004.
2. Advanced Reinforced Concrete Design (vol-II) by S. S. Bhavikatti, New age international, 2nd edition, 2009.
3. Design of steel structures by L.S Negi Tata Mc Graw Hill publishing company Limited, 2nd edition, 1997

4. Earthquake Resistant Design of structures by Pankaj Agarwal and Manish Shrikande PHI Learning Private Limited. 2006.

STRUCTURAL DYNAMICS

UNIT-I Equation of Motions, Problem Statement, Solution Methods of Single Degree of Freedom Systems (SDOF) Basic concepts of structural dynamics; single degree of freedom system, force displacement relationship, damping force, equation of motion, mass-spring-damper system, methods of solution of differential equation.

UNIT-II Free Vibration (SDOF): Undamped free vibration, viscously damped free vibration, energy in free vibration.

Response to Harmonic and Periodic Excitations (SDOF)

Harmonic vibration of undamped systems, Harmonic vibration with viscous damping, response to vibration generator, natural frequency and damping from harmonic test, force transmission and vibration isolation, vibration measuring instruments, energy dissipated in viscous damping. Response to periodic force.

UNIT-III Response to Arbitrary, Step And Pulse Excitations (SDOF)

Response to unit impuse, response to arbitrary force, step force, ramp force, response to pulse excitations, solution methods, effects of viscous damping.**Numerical Evaluation of Dynamic Response (SDOF)**Time stepping methods, methods based on interpolation of excitation, central difference method, newmark's method, stability and computational error, analysis of nonlinear response by newmark's method.Earthquake Response to Linear Systems (SDOF)Earthquake excitation, equation of motion, response quantities, response history, response spectrum concept, deformation, pseudo-velocity and pseudo acceleration response spectra, peak structural response from the response spectrum, response spectrum characteristics, elastic design spectrum, comparison and distinction between design and response spectra.

UNIT-IV Generalised Single Degree of Freedom Systems

Generalised SDOF systems, rigid body assemblages, systems with distributed mass and elasticity, lumped mass system-shear building, natural vibration frequency by Rayleigh's method.**Multi -degree of freedom systems (MDOF)** Equation of motions: simple system-two storey shear building, general approach for linear systems, static condensation, symmetric plan systems: ground motion. Multiple support excitation, methods of solving the equation of motions.

UNIT-V Free Vibration (MDOF) Natural frequencies and modes: systems without damping, modal and spectral matrices, orthogonality of modes, normalization of modes. Solution of undamped free vibration systems, solution methods for eigenvalue problem.

Text Books:

1. Dynamics of structures by Anil K Chopra; Prentice-Hall of India Limited, New Delhi.3rd edition 2006.
2. Dynamics of Structures by R.W. Clough and P.E. Penzien, McGraw-Hill. 1st edition 1975

Reference Books:

1. Structural Dynamics for Structural Engineers by G. C. Hart & K. Wang; John Wiley & Sons. 1st edition 1991

2. Structural Dynamics by Mario Paz, CBS Publishers.1st edition 1991.

TRAFFIC ENGINEERING

UNIT-I.TRAFFIC CHARACTERISTICS:

Basic traffic characteristics - Speed, volume and concentration. Relationship between Flow, Speed and Concentration TRAFFIC MEASUREMENT AND ANALYSIS:Volume Studies - Objectives, Methods; Speed studies - Objectives: Definition of Spot Speed, time mean speed and space mean speed; Methods of conducting speed studies;

UNIT-II SPEED STUDIES:

Methods of conducting speed studies; Presentation of speed study data; Head ways and Gaps; Critical Gap; Gap acceptance studies. HIGHWAY CAPACITY AND LEVEL OF SERVICE:Basic definitions related to capacity; Level of service concept; Factors affecting capacity and level of service; Computation of capacity and level of service for two lane highways Multilane highways and free ways.

UNIT-III PARKING STUDIES AND ANALYSIS:

Types of parking facilities - on street parking and off street Parking facilities; Parking studies and analysis.

UNIT-IV TRAFFIC SAFETY:

Accident studies and analysis; Causes of accidents - The Road, The vehicle, The road user and the Environment; Engineering, Enforcement and Education measures for the prevention of accidents.

UNIT- V TRAFFIC CONTROL AND REGULATION:

Traffic Signals - Design of Isolated Traffic Signal by Webster method, Warrants forsignalisation, Signal Co-ordination methods, Simultaneous, Alternate, Simple progressic and Flexible progression Systems.TRAFFIC AND ENVIRONMENT:

Detrimental effects of Traffic on Environment; Air pollution; Noise Pollution; Measures tocurtail environmental degradation due to traffic.

REFERENCES:

1. Traffic Engineering and Transportation Planning - L.R. Kadiyali, Khanna Publishers.

2. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice Hall Publication.

3. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter P.

Kilareski, John Wiley & 50ns Publication.

4. Transportation Engineering - An introduction - C. Jotin Khistry, Prentice Hall Publication.

5. Fundamentals of Transportation Engineering - C.S.Papacostas, Prentice Hall India.

FINITE ELEMENT ANALYSIS

UNIT-I

Basic Principles
Equilibrium equations; Strain-displacement relations; linear constitutive relations; Principle virtual work; Principle of stationary potential energy

UNIT-II

Element Properties
Different types of elements; Displacement models; Relation between nodal degrees of freedom and generalized coordinates; Convergence requirements; Compatibility requirement; Geometric invariance; Natural coordinate systems; Shape functions; Element strains and stresses; Element stiffness matrix; Element nodal load vector. Isoparametric elements – Definition, Two-dimensional isoparametric elements – Jacobian transformation, Numerical integration

UNIT-II

Direct Stiffness method and Solution Technique
Assemblage of elements–Obtaining Global stiffness matrix and Global load vector; Governing equilibrium equation for static problems; Storage of Global stiffness matrix in banded and skyline form; Incorporation of boundary conditions; Solution to resulting simultaneous equations by Gauss elimination method

UNIT-IV

Plane-stress and Plane-strain analysis
Solving plane stress and plane-strain problems using constant strain triangle and four nodded isoparametric element

UNIT-V

Analysis of plate bending
Basic theory of plate bending; Shear deformation plates; Plate bending analysis using four noded isoparametric elements

Text Books:

1. Introduction to Finite Elements in Engineering by R.T. Chandrupatla and A.D. Belegundu, Prentice Hall of India, 1997.

Reference Books:

1. Finite Element Analysis by Abel and Desai, New Age Publishers, 2007.
2. Finite Element Analysis: Theory and Programming by C. S. Krishnamoorthy, Tata McGraw- Hill, 1995
3. Finite Element Procedures in Engineering Analysis by K. J. Bathe, Prentice Hall Inc., 1996.
4. The Finite Element Method by O.C. Zienkiewicz, and R.L.Taylor, McGraw – Hill, 1987.

K L University
Department of CSE
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

MOBILE COMPUTING

L-T-P: 3-0-0(3)

UNIT – I:

Mobile Communications: An Overview: Mobile communication, Mobile computing, Mobile computing architecture, Mobile Devices, Mobile system Networks, Data dissemination, Mobility management.

Mobile Devices and Systems: Mobile phones, Digital music players, Handheld pocket computers, Handheld devices, Smart systems, Limitations of mobile devices, Automotive systems. **(9)**

UNIT – II:

GSM and Similar Architectures: GSM – Services and system architecture, Radio interfaces, Protocols, Localization, Calling, Handover, Security, New data services, General packet radio service, High speed circuit switched data, DECT.

Wireless Medium Access Control and CDMA-based Communication: Medium access control, Introduction to CDMA- based systems, Spread spectrum in CDMA systems, Coding methods in CDMA, IMT-2000, i-mode, OFDM. **(9)**

UNIT-III:

Mobile IP Network Layer: IP and mobile IP network layers, Packet delivery and handover Management, Location management, Registration, Tunneling and encapsulation, Route optimization, Dynamic host configuration protocol.

Mobile Transport Layer: Conventional TCP/ IP transport layer protocol, Indirect TCP, Snooping TCP, Mobile TCP, Other Methods of TCP-layer transmission for mobile networks, TCP over 2.5G/3G mobile networks.

Databases: Database hoarding techniques, Data caching, Client-Server computing and Adaptation, Transactional models, Query processing, Data recovery process, Issues relating to Quality of service. **(9)**

UNIT-IV:

Data Dissemination and Broadcasting Systems: Communication asymmetry, Classification of data-delivery mechanisms, Data dissemination broadcast models, Selective tuning and indexing techniques, Digital audio broadcast models, Selective tuning and indexing techniques, Digital audio broadcasting, Digital video broadcasting.

Data Synchronization in Mobile Computing Systems: Synchronization, Synchronization software for model devices, Synchronization protocols, SyncML-Synchronization language for mobile computing, Sync4J , Synchronized multimedia markuplanguage. **Mobile Devices: Server and Management:** Mobile agent, Application server, Gateways, Protocol, Service discovery, Device management, Mobile file systems, Security. **Mobile Ad-hoc and Sensor Networks :** Introduction to Mobile Ad-hoc Networks, MANET, Wireless sensor networks. **(9)**

UNIT–V:

Wireless LAN, Mobile Internet Connectivity, and Personal Area Network: Wireless LAN architecture and protocol, WAP 1.1 and WAP 2.0 architecture, XHTML-MP, Bluetooth-enabled devices network, Layers in Bluetooth protocol, Security in Bluetooth protocol,IrDA ZigBee.

Mobile Application Languages XML, Java, J2ME, and JavaCard :

Introduction , XML, JAVA, Java 2 micro edition, JavaCard.

Mobile Operating Systems: Operating system, palmOS, Windows CE, Symbian OS, Linux form mobile devices. **(9)**

TEXT BOOKS:

1. Raj Kamal, "Mobile Computing", Oxford University Press, New Delhi, 2007.

REFERENCES:

1. Jochen H. Schller, "Mobile Communications", second edition, Pearson Education, New Delhi, 2007.
2. Jon W. Mark, Weihua Zhuang, "Wireless Communications and Networking", Prentice Hall, New Delhi, 2007.

MOBILE COMPUTING (MC)

Time : 3 Hrs. Max Marks: 100

Answer any 5 questions of the following 5X20 = 100

1. (a) Explain the architecture of Mobile computing. [10]

(b) Explain about Localization and calling in GSM. [10]

2. a) Explain the problems of wireless transmission wrt to exposed and hidden terminals [10]

b) Compare the 4 medium access systems SDMA,TDMA,FDMA & CDMA. [10]

3. a) Write detail notes on IP encapsulation mechanisms. [10]

b) How can DHCP be used for mobility and support of Mobile IP? [10]

4. a) Explain the working of Snooping – TCP its advantages & disadvantages. [10]

b) Why is timeout freezing required in case of mobile nodes? What are the modifications made in data link and TCP layers to enforce time-out freezing? [10]

5. a) Write in detail of Cache invalidation mechanisms? [10]

b) Explain query-processing architecture for processing a query using distributed databases. [10]

6. a) Explain the reasons for communication asymmetry in mobile network. Give [10]

examples of asymmetric communication architecture for data dissemination.

b) Explain index-based method of selective tuning and indexing techniques. [10]

7. a) Why is routing in multi-hop ad-hoc networks complicated, what are the special challenges? [10]

b) How does dynamic source routing handle routing? What is the motivation behind dynamic source routing compared to other routing algorithms from fixed networks? [10]

8. a) Explain the functions of link manager in Bluetooth [10]

b) Explain wireless datagram protocol and transaction protocol [10]

NETWORK ROUTING **L-T-P: 3-1-0 (4)**

UNIT 1

Network and Network routing: An Introduction: Addressing and internet service: An Overview, Network Routing: An Overview, IP Addressing, On Architectures, Service Architecture, Protocol Stack Architecture, Router Architecture, Network Topology Architecture, Network Management Architecture, Public Switched Telephone Network, Communication Technologies, Standards Committees, Last Two Bits.

Routing Algorithms: Shortest Path Widest Path: Background, Bellman-Ford Algorithm and Distance Vector Approach, Dijkstra's Algorithm, Comparison of the Bellman-Ford Algorithm and Dijkstra's Algorithm, Shortest Path Computation with Candidate Path Caching, Widest Path Computation with Candidate Path Caching, Widest Path Algorithm, K-Shortest Paths Algorithm.

Routing Protocols: Frame Work and Principles: Routing Protocol, Routing Algorithm And Routing Table, Routing Information Representation and Protocol Messages, Distance Vector Routing Protocol, Link State Routing Protocol, Path Vector Routing Protocol, Link Cost. **Network Flow Modeling:** Terminologies, Single-Commodity Network Flow, Multi Commodity Network Flow: Three-Node Example, Multi Commodity Network Flow Problem: General Formulation, Multi Commodity Network Flow Problem: Non-Splittable Flow. **(9)**

UNIT 2

IP Routing and Distance Vector Protocol Family: Routers, Networks and Routing Information: Some Basics, Static Routes, Routing Information Protocol Version 1(RIP v1), Routing Information Protocol Version 2 (RIP v2), Enhanced Interior Gateway Routing Protocol (EIGRP), Route Redistribution.

OSPF and Integrated IS-IS: From a Protocol Family To Instance of a Protocol, OSPF Packet Format, Examples of Router LSAs and Network LSAs, Integrated IS-IS, Similarities and Differences Between IS-IS and OSPF.

IP Traffic Engineering: Traffic, stochasticity, Delay and Utilization, Applications View, Traffic Engineering: An Architectural Framework, Traffic Engineering: A Four-Node Illustration, Link weight Determination Problem: Preliminary Discussion, Duality of the MNCF Problem, Illustration Of Link Weight Determination Through Duality, Link Weight Determination: Large Networks. **(9)**

UNIT 3

BGP: BGP:A brief Overview, BGP: Basic Terminology, BGP Operations, BGP Configuration Initialization, Two Faces of BGP: External BGP and Internal BGP, Path Attributes, BGP Decision Process, Internal BGP Scalability, Route Flap Dampening, BGP Additional Features, Finite State Machine of a BGP Connection, Protocol Message Format.

Internet Routing Architectures: Internet Routing Evolution, Addressing and Routing: Illustrations, Current Architectural View of the Internet, Allocation of IP Prefixes and AS Number, Policy-Based Routing, Point Of Presence, Traffic Engineering Implications, Internet Routing Instabilities.

Router Architectures: Functions of a Router, Types of Routers, Elements of a Router, Packet Processing: Fast Path Vs Slow Path, Router Architectures. **(9)**

UNIT 4

IP Address Lookup Algorithms: Impact of addressing on lookup, Longest Prefix Matching, Naïve Algorithms, Binary Trees, Multibit Trees, Compressing Multibit Trees, Search by Length Algorithms, Search by Value Approaches, Hardware Algorithms, Comparing Different Approaches.

IP Packet Filtering and Classification: Importance of Packet Classification, Packet Classification Algorithms, Naïve Solutions, Two-dimensional Solutions, Approaches for d dimensions, Extending Two-Dimensional Solutions, Divide and Conquer Approaches, Tuple Space Approaches, Decision Tree Approaches, Hardware-Based Solutions. **(9)**

UNIT 5

Quality of Service Routing: Background, QOS Attributes, Adapting Shortest Path and Widest Path Routing: A Basic Framework, Update Frequency, Information Inaccuracy and Impact on Routing, Lessons from dynamic call Routing in the Telephone Network, Heterogeneous Service, Single-Link Case, A General Framework for Source-based QOS Routing with Path Caching, Routing Protocols for QOS Routing.

MPLS and GMPLS: Background, Traffic Engineering Extension to Routing Protocols, Multiprotocol Label Switching, Generalized MPLS, MPLS Virtual Private Networks. **Routing and Traffic Engineering With MPLS:** Traffic Engineering of IP/MPLS Networks, VPN Traffic Engineering, Routing/Traffic Engineering for Voice Over MPLS. **VOIP Routing: Interoperability Through IP and PSTN:** Background, PSTN Call Routing Using the Internet, PSTN Call Routing: Managed IP Approach, IP –PSTN Interworking for VOIP, IP Multimedia Subsystem, Multiple Heterogeneous Providers Environment, All-IP Environment for VOIP Services, Addressing Revisited. **(9)**

TEXTBOOK:

1. Network Routing Algorithms, Protocols, and Architectures Deepankar Medhi, Karthikeyan Ramasamy 2007 by Elsevier Inc.

REFERENCES:

1. Nader F.Mir, ”Computer and Communication Networks”, PHI

Kurose & Ross, “Computer Networks” – A Top-down approach featuring the Internet”, Pearson Education – Alberto Leon – Garciak.

NETWORK ROUTING

Model Paper

1. A) With the help of neat diagram explain the Router Architecture

   B) Comparison of the Bellman-Ford Algorithm and Dijkstra's Algorithm

2. A) Explain the Routing Algorithm And Routing Table

   B) Explain General Formulation of Multi Commodity Network Flow Problem

3. A) Explain comparison between Routing Information Protocol Version 1(RIP v1), and Version 2 (RIP v2)

   B) Differences Between IS-IS and OSPF

4. A) Explain an Architectural Framework of IP Traffic

   B) Explain Finite State Machine of a BGP Connection and Protocol Message Format.

5. A) Explain what are the Traffic Engineering Implications

   B) What are the Functions and elements of a Router?

6. A) Explain Search by Length and Search Value Approaches

   B) What are the importances of Packet Classification?

7. A) Explain Source-based QOS Routing with Path Caching of General Framework

   B) Explain Routing/Traffic Engineering for Voice over MPLS

8. A) Explain PSTN Call Routing Using the Internet

   B) Explain IP Packet Filtering Divide and Conquer Approaches

AD HOC WIRELESS NETWORKS SYLLABUS

UNIT I

Fundamental of Wireless communication: Computer networks, Computer network software, Computer network Architecture (OSI Reference Model, TCP/IP Reference Models, ATM Reference Model)

ADHOC Wireless Networks.

Introduction, Issues in ADHOC Wireless Networks. ADHOC Wireless Internet.

UNIT II

MAC Protocols for ADHOC Wireless Networks.

Introduction, Issues in Designing a MAC Protocol for ADHOC Wireless Networks, Design Goals of a MAC Protocol for ADHOC Wireless Networks. Classifications of MAC Protocols, Contention-Based Protocols, Contention-Based Protocols with Reservation Mechanisms, Contention-Based MAC Protocols with Scheduling Mechanisms.

UNIT III

Routing Protocols for ADHOC Wireless Networks.

Introduction, Issues in Designing a Routing Protocol for ADHOC Wireless Networks, Classifications of Routing Protocols, Table-Driven Routing Protocols, On-Demand Routing Protocols. Hybrid Routing Protocols. Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols.

UNIT IV

Transport Layer and Security Protocols for ADHOC Wireless Networks.

Introduction. Issues in Designing a Transport Layer Protocol for ADHOC Wireless Networks. Design Goals of a Transport Layer Protocol for ADHOC Wireless Networks. Classification of Transport Layer Solutions. TCP Over ADHOC Wireless Networks. Other Transport Layer Protocols for ADHOC Wireless Networks.

Security in ADHOC Wireless Networks: Network Security Requirements. Issues and Challenges in Security Provisioning. Network Security Attacks. Key Management. Secure Routing in ADHOC Wireless Networks.

UNIT V

Quality of Service in ADHOC Wireless Networks.

Introduction. Issues and Challenges in Providing QoS in ADHOC Wireless Networks. Classifications of QoS Solutions. MAC Layer Solutions. Network Layer Solutions.

TEXT BOOK

1. C.Siva Ram Murthy and B.S Manoj, Ad Hoc Wireless Networks: Architectures And Protocols, Pearson Education India, 2004.

REFERENCES

1. Charles E. Perkins, Ad hoc Networking, Addison – Wesley, 2000

ADHOC WIRELESS NETWORKS

MODEL Question paper

1. Explain any six issues of ADHOC wireless networks.
2. Describe in detail, MACAW and MACA-BY-invitation protocol.
3. Explain any two contentions based with preservation mechanism MAC protocols.
4. Explain the issues and design goals of transport layer protocol for ADHOC networks.
5. Explain ADHOC and split TCP.
6. Give the classification of security attacks in ADHOC wireless networks. And Explain the key management in ADHOC wireless networks.
7. Explain the issues and challenges in providing QoS in ADHOC wireless networks.
8. Explain:
   a) Cluster TDMA protocol for MAC layer QoS.
   b) Ticket-based QoS routing protocol QoS.

WIRELESS COMMUNICATION AND NETWORKS

L-T-P: 3-0-0(3)

UNIT I

Overview of communications

Introduction, **Transmission fundamentals**- signals for conveying information, analog and digital data transmission, channel capacity, transmission media, multiplexing.

Antennas and wave propagation- antennas, propagation modes, line-of-sight transmission, fading in the mobile environment.

Modulation techniques- signal encoding criteria, digital data, analog signals, analog data, analog signals, analog data, digital signals, spread spectrum modulation, frequency hopping spread spectrum, code division multiple access.

Communication networks- LANs, MANs, and WANs, switching techniques, circuit switching, packet switching, asynchronous transfer mode. **(9)**

UNIT II

Wireless Networks Protocols and the TCP/IP suite- the need for protocol architecture, the TCP/IP protocol architecture, the OSI model, internetworking.

Cellular wireless networks- principles of wireless networks, first generation analog, second-generation TDMA, CDMA, third-generation systems. **(9)**

UNIT III

Wireless link improvement techniques- equalization, diversity, error detection, block error correction codes, convolutional codes, automatic repeat request

Multiple access in wireless system- multiple access scheme, frequency, time, code, space division multiple access, packet radio access.

S**atellite communications-** satellite parameters and configurations, capacity allocation-frequency division, time division. **(9)**

UNIT IV

Wireless system operations and standards

cordless systems, wireless local loop, WiMAX and IEEE 802.16 broadband wireless access standards.

Mobile IP and wireless application protocol- mobile IP, wireless application protocol.

wireless LAN technology- overview, infrared LANs, spread spectrum LANs, narrowband microwave LANs. **(9)**

UNIT V

Wi-Fi and the IEEE 802.11 wireless LAN standard-

IEEE 802 architecture, IEEE 802.11 architecture and services, IEEE 802.11 medium access control, IEEE 802.11 physical layer, other IEEE 802.11 standards, Wi-Fi protected access.

Bluetooth and IEEE 802.15.500

overview, radio specification, baseband specification, link manager specification, logical link control and adaptation protocol, IEEE 802.15,538. **(9)**

Textbooks:

1. William Stallings "**Wireless communication and networking**" (Pearson Education/ PHI)
2. Vijay K. Garg "**Wireless communication and networking**" Morgan Kaufmann Publishers 2007.

Reference Books:

1. Andrea GoldSmith "**Wireless Communication**" Cambridge Press
2. Anurag Kumar, D. Manjunath and Joy Kuri "**Wireless Networking**" , Morgan Kaufmann Publishers.

WIRELESS COMMUNICATION AND NETWORKS

Time : 3 Hrs. Max Marks: 100

Answer any 5 questions of the following 5X20 = 100

1. a) Explain in detail about 3 modes of propagation in detail? 10M

b) Write about code division multiple accesses and frequency hopping spread spectrum. 10M

2. a) Differentiate between circuit switching and packet switching. 10M

b) Explain the quantization process in detail and the multiplexing technique in digital communication 10M

3. a)Explain about logic link control of Blue tooth. 12M

b)Draw IEEE 802 architecture and discuss the services of IEEE 802.11 8M

4. a)Discuss the Application areas of wireless LAN and mention the requirements of wireless LAN.10M

b) Discuss T D M A frame structure and derive an expression for efficiency of T D M A. 10M

5. Explain the Following.

a) Infrared LANS 8M

b) Wi Max and IEEE 802.16 broadband wireless access standards. 12M

6. a)Explain the routing, localization and handover in satellite system. 10M

b)Describe the various types of hybrid spread spectrum multiple access techniques. 10M

7. a) Bring out the major difference between wireless and fixed telephone networks, mention the limitations of wireless networking. 10M

b) Explain the working with a neat block schematic of 1st generation cellular radio network. 10M

8. a) Explain registration and encapsulation operation in mobile IP. 10M

b) Explain Indirect TCP and Snooping TCPs 10M

DIGITAL FORENSICS

Unit I

Computer Forensics Fundamentals : What is computer forensics-use of computer forensics in law enforcement-computer forensics assistance to human resources/employment proceedings-computer forensics services-benefits of professional forensics methodology-steps taken by computer forensics specialists

Unit II

Computer Forensics Evidence Capture: Data recovery defined-data backup and recovery-the role of backup in data recovery-the data recovery solution

Evidence Collection and Data Seizure: evidence-collection options-obstacles-types of evidence-the rules of evidence-volatile evidence-general procedure-collection and archiving-methods of collection-artifacts-collection steps-controlling contamination: the chain of custody

Network Forensics: Network forensics overview-performing live acquisitions-developing standard procedures for network forensics-using network tools

UNIT III

Duplication and Preservation of Digital Evidence: Preserving the digital crime scene-computer evidence processing steps-legal aspects of collecting and preserving computer forensic evidence

Computer Forensics Analysis and Validation: Determining what data to collect and analyze-validating forensic data-addressing data-hiding techniques-performing remote acquisitions

Processing Crime and Incident Scenes: Identifying digital evidence-collecting evidence in private sector incident scenes-processing law enforcement crime scenes-preparing for a search-securing a computer incident or crime scene-seizing digital evidence at the scene-storing digital evidence-obtaining a digital hash-reviewing a case

UNIT IV

E-mail Investigations: Exploring the role of e-mail in investigations-exploring the roles of the client and server in e-mail-investigating e-mail crimes and violations-understanding e-mail servers-using specialized e-mail forensic tools

Cell phone and mobile device forensics: Understanding mobile device forensics-understanding acquisition procedures for cell phones and mobile devices

UNITIV

Working with Windows and DOS Systems: Understanding file systems-exploring Microsoft file structures-examining NTFS disks-understanding whole disc encryption-windows registry-Microsoft startup tasks-MS-DOS startup tasks-virtual machines

Current Forensic Tools: Evaluating computer forensic tool needs-computer forensic software tools-computer forensic hardware tools-validating and testing forensic software

Model Question Paper

Answer any Five

1. What is computer forensics? Explain the use of computer forensics in law enforcement.

2. a) Discuss a solution for data recovery
   b) Explain controlling contamination: The chain of custody.

3. a) Explain the process of validating the forensic data.
   b) What is live acquisition? How are they performed?

4. a) Explain the forensic tools used for e-mail investigation.
   b) Discuss about mobile forensic tools.

5. Write short notes on
   a. FAT disks
   b. Windows Registry
6. Explain the following business computer forensics technologies.
   a. Remote monitoring of target computers
   b. Theft recovery software for laptops and PCs.

7. Give the overview of network forensics.
8. Explain the acquisition procwedure for cell phones and mobile devices

CLOUD COMPUTING

L-T-P: 3-0-0(3)

UNIT-1

Cloud Computing Basics: Overview, Applications, Intranet and the Cloud, First Movers on the cloud, the need for Cloud Computing, Benefits of cloud Computing, Limitations of the Cloud Computing, security concerns and regulatory issues, over view of different cloud computing applications which are implemented, Business case for implementing a Cloud

Introduction to Cloud Computing(Book-2): What and what is not cloud computing, Moving from collaboration to cloud, Cloud Architectures, cloud storage, cloud Services, reasons for cloud computing, pros and cons of cloud computing, benefits of cloud computing, users of cloud computing **(9)**

UNIT-II Cloud Computing Technologies: Hardware and Infrastructure: Clients, Security, Network, services

Accessing the Clouds: Platforms, WEB applications, WEB APIS, WB Browsers

Cloud Storage: Overview, Storage provides, **Cloud Standards**: Applications, Client, Infrastructure, Services **(9)**

UNIT-III Cloud Computing Mechanisms: Software as a service: Overview, Driving Forces, Company offerings, Industries, Software + services: Overview, Mobile Device Integration, Providers, Microsoft Online

Application development: Google, Microsoft, Intuit Quick base, Cast Iron Cloud, Bungee Connect, **Development Platforms**: Google, Sales Force, Azure, Trouble shooting, Application management **(9)**

UNIT-IVLocal Clouds: Virtualization, server solutions, Thin Clients

Migrating to the clouds: Cloud services for individuals, Mid-market, and Enterprise wide, Migration, best practices, analyzing the service **(9)**

UNIT V (BOOK-2)

Using Cloud Services: Collaborating on Calendars, Schedules, and Task Management, Collaborating on Event management, Collaborating on Contact management, collaborating on Project Management, Collaborating on Word Processing, Collaborating on Spread sheets, Collaborating on Databases, Collaborating on presentations, Storing and sharing Files and other online content, sharing Digital Photographs, controlling the collaborations with Web-Based Desktops

Online Collaborations: Collaborating Via WEB based communication Tools, Collaborating Via Social Networks and Groupware, collaborating Via Blogs and Wikis **(9)**

Text Books:

1. Cloud Computing a Practical approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, Tata McGraw-HILL, 2010 Edition
2. Cloud Computing-Web Based applications that change the way you work and collaborate online, Michael Miller, Pearson Education, 2009 Edition

CLOUD COMPUTING

Model Question Paper

Time: 3hrs Max. Marks: 100

Answer ANY 5 of the following. Each question carries 20 marks

1.

(a) Illustrate the cloud Architectures and cloud services.

(b) Explain the implementation of cloud in a business case.

2.

(a) Elaborate the cloud computing Technologies.

(b)Write a note on cloud standards.

3. Distinguish between software as a service and Software + services with real time examples.

4. Write a case study of cloud mobile device integration.

5.(a) What is virtualization? Explain different types.

(b) Analyze the service on migrating to the clouds.

6. Illustrate the collaborating on event management and on project management with a neat diagram

7.Analyze the storing, sharing files and sharing digital photographs in cloud computing.

8.

a) Define Cloud computing, Enlist and explain essential characteristics of cloud computing.

b) Explain the services provided by the Amazon infrastructure cloud from a user perspective

CRYPTO ANALYSIS **L-T-P: 3-0-0(3)**

UNIT 1

CLASSIC CIPHERS: Introduction, Good Guys And Bad Guys, Terminology, Selected Classic Crypto Topics.

WORLD WAR II CIPHERS: Introduction, Enigma, Purple, Sigaba. **(9)**

UNIT 2

STREAM CIPHERS: Introduction, Shift Registers, ORYX, RC4, PKZIP.

BLOCK CIPHERS: Introduction, Block Cipher Modes, Feistel Cipher, Hellmans Time-Memory Trade-off, CMEA, Akelarre, FEAL**(9)**

UNIT 3

HASH FUNCTIONS: Introduction, Birthdays and Hashing, MD4, MD5. **(9)**

UNIT 4

PUBLIC KEY SYSTEMS: Introduction, Merkle-Hellman Knapsack, Diffie-Hellman Key Exchange, Arithmetica Key Exchange, RSA, Rabin Cipher, NTRU Cipher, ElGamal Signature Scheme**(9)**

UNIT 5

PUBLIC KEY ATTCAKS: Introduction, Factoring Algorithms, Discrete Log Algorithms, RSA Implementation Attacks. **(9)**

TEXTBOOK:

1. Appllied Cryptanalysis Breaking Ciphers in the Real World by Mark Stamp, Richard M. Low John

REFERENCES:

1. Applied Cryptography Seconf Edition Bruce Schneier Wiley India Edition
2. Cryptography and network Security, Fourth edition, William Stallings, PHI/Pearson

SECURE SYSTEMS DEVELOPMENT WITH UML

L-T-P: 3-1-2(5)

UNIT-I:

UML Overview: Use case diagram, Sequence diagram, Collaboration diagram, Class diagram, State Chart diagram, Activity diagram, Component diagram, Deployment diagram, Package Diagram. (9)

UNIT-II:

Introduction: Overview,outline,how to use this book. Walk through :Using UML for Security:security requirements capture with use case diagrams,secure business processes with activity diagrams,physical security using deployment diagrams, security-critical Interaction with sequence diagrams.Background: Security Engineering,UML,Analyzing UML Models. Model-based security engineering with UML: UML Security profile,Design principles for secure systems,Applying security patterns. (9)

UNIT-III:

Applications: Secure channels,A variant of the IP TLS,Common Electronic Purse Specifications,Developing Secure Java Programs,Further Applications. (9)

UNIT-IV:

Tool Support for UML Security: Extending UML CASE Tools with analysis tools,Automated Tools for UML Security,Linking Models to Run time data ,Linking models to code .A Formal Foundation: UML Machines,UML Machine systems,Refinement,Rely-Guarantee Specifications,Reasoning about security properties. (9)

UNIT-V:

Formal Systems development with UML: Formal Semantics for a Fragment of UML,Development with UML .Further material: More on the UML security approach,Other approaches to security Engineering. (9)

TEXT BOOKS:

1. Secure Systems Development with UML .JAN, JURJENS. SPRINGER 2004.

2. Object Oriented systems development .Ali Bahrami

REFERENCE BOOKS:

1. R.Heldal and F.Hultin,Bridging model based and language based security.

2. R.Anderson. Security Engineering,A Guide to building dependable distributed systems , john willey & Sons ,Newyork 2001.

SECURE SYSTEMS DEVELOPMENT WITH UML

PRE-PHD EXAMINATION

I Answer any FIVE of the following Max. Marks:100

Each question carries 20 marks

1. a) Draw a design class diagram for BANK ATM SYSTEM.

   b) Draw a sequence diagram for a University Database.

2. Write short notes on

   a) Security Engineering

   b) Design principles for secure systems

3. Explain in detail about security-critical Interaction with sequence diagrams.
4. Illustrate the importance of Model-based security engineering by using any four UML diagrams.
5. How the Common Electronic Purse Specifications (CEPS) helps in security modeling. Illustrate with suitable example.
6. Can we provide tools for secure systems development with UML? Validate the statement.
7. Analyze how the formal semantics of UML subsystems is used in the development of critical systems.
8. Discuss various approaches to security engineering in detail.

DATA SECURITY

L-T-P: 3-0-0(3)

Unit-I:

Introduction: Security Trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Recommended Reading & Web Sites.

Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.

Block Ciphers & the Data Encryption Standard: Block Cipher Principles, The Data Encryption Standard, The Strength of DES, Differential & Linear Cryptanalysis, Block Cipher Design Principles. **(9)**

Unit – II

Advanced Encryption Standard: Evaluation Criteria for AES, The AES Cipher.

More on Symmetric Ciphers: Multiple Encryption & Triple DES, Block Cipher Modes of Operation, Stream Ciphers & RC4.

Confidentiality Using Symmetric Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.

Public – Key Cryptography & RSA: Principles of Public – key Cryptosystems, The RSA Algorithm.**(9)**

Unit – III

Key Management; Other Public-Key Cryptosystems: Key Management, Diffie – Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions & Macs.

Hash & AC Algorithms: Secure Hash Algorithm, Whirlpool, HMAC, CMAC. **(9)**

Unit-IV

Digital Signatures & Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standard.

Authentication Applications: Kerberos, X.509 Authentication Service, Public – Key Infrastructure.

Electronic Mail Security: Pretty Good Privacy, S/MIME. **(9)**

Unit – V

IP Security: IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations, Key Management.

Web Security: Web Security Considerations, Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction.

Firewalls: Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation. **(9)**

TEXT BOOKS:

1. 'Cryptography and Network Security', William Stallings, 4/E Publisher: Prentice Hall

Reference Books:

1) 'Network Security: Private Communication in a Public World', Charlie Kaufman, Radia Perlman Mike Speciner, Publisher: Prentice Hall 2/E.
2) 'Cryptography and Network Security', Atul Kahate, Publisher TATA McGraw- Hill Publishing Co Edition 2003.
3) 'Fundamentals of Network Security', Eric Maiwald, Publisher TATA McGraw-Hill Publishing Co 2003

DATA SECURITY

Model Paper

1. A) Briefly explain the four types of security attacks?

   B) Briefly explain any two Substitution Techniques and Transposition Techniques?

2. A) Draw and explain the simple round function of DES?

   B) What are the characteristics of advanced symmetric block ciphers? Explain.

3. A) Discuss the RSA Algorithm

   B) Briefly explain Diffie Hellman Key Exchange

4. A) Briefly explain Secure Hash Algorithm

   B) Explain the different authentication procedures in X.509 certificate.

5. A)Write the summary of Kerberos version five message exchange

   B) Explain the PGP message generation and reception process

6. A) Explain S/MIME certificate processing method.

   B) Explain IP security authentication header with a neat diagrm.

7. A) With a neat diagram explain the basic combination of security association.

   B) Explain SSL handshake protocol with a neat diagram

8. What is firewall? Explain categories of firewalls based on processing mode.

DATA MINING

L-T-P: 3-0-0(3)

Unit-I

Introduction, Motivating Challenge, Origin of data mining, Data Mining Tasks, Types of data, Attributes & Management, Types of data sets, Data Quality Measurement & data collection issues, Data Preprocessing Aggregation, Sampling, Dimensionality reduction feature subset selection, Feature creation, Discrimination and Binarization, Variable Transformation, Similarity and dissimilarity between simple attributes, Issues in proximity selection, Summary statistics, OLAP, Multi Dimension Analysis. **(9)**

Unit-II

Introduction to Classification, Decision Tree Induction, Algorithm for Decision Tree Induction, , Rule based classifier, Nearest neighbor classifier, Bayesian classifier, Artificial Neural Networks, Support Vector Machine. **(9)**

Unit-III

Introduction to association analysis, Frequent item set generation, Rule generation, Alternate methods of generating frequent item sets, FP-Growth algorithm, Evaluation of association patterns, , Handling categorical attributes, Handling continuous attributes, Handling a concept hierarchy. **(9)**

Unit-IV

Overview of k-means, Agglomerative, hierarchical clustering, DBSCAN, Anomaly detection, Statistical approach, Proximity& density based outlier detection**. (9)**

Unit-V

Characteristics of data, clusters& clustering algorithms, Prototype& density based clustering, Scalable clustering algorithm, Decision on which clustering algorithm is to be used. **(9)**

Text Book:

1. Introduction to Data Mining P.Tan, M.Steinbach, Vipin Kumar Pearson Education, III Impression, 2009.

Reference Books

1. Data Mining Concepts and Techniques, J.Han, M. Kamber, Elsevier, II Edition, 2008

DATA MINING

Model Paper

I. Answer ANY FIVE Questions of the following 5 X 20=100 Marks

1.a) Explain about Data Preprocessing. Why is it done and how?
b) Write about the issues in data mining.

2. a) Explain briefly about Bayesian Classifier.
b) Explain in detail the technique of data classification, identifying its objectives.

3. a) Write and explain the algorithm for mining frequent item sets without candidate generation. Give relevant example.
b) Describe the methods for the generation of Concept Hierarchy for Categorical Data.

4. a) Consider the market basket data represented in binary format in the following table.

Trans_id	Bread	Milk	Butter	Complan	Jelly
1	0	1	1	1	0
2	0	1	1	0	0
3	1	1	1	0	0
4	0	1	0	0	1
5	1	0	0	0	1

Generate association rules using Apriori association rule generation algorithm.

b) Discuss Data Visualization and Hierarchical clustering as a Data Mining technique.

5. a) Discuss data integration and data transformation in detail.
b) Explain the features of Density- based clustering methods.

6. a) Discuss the Data Mining Process with suitable diagram, explain each component.
b) List some of the analytically models used in Data Mining.

7. a) Discuss about the different types of data in clustering analysis.
b) Explain DBSCAN algorithm with an example.

8. a) Explain the representative object based clustering technique in detail.
b) Write short note on: (1) Issues regarding classification and prediction
(2) Outlier Analysis.

DATA WAREHOUSING

L-T-P: 3-0-0(3)

UNIT – I The compelling need for data warehousing: Escalating need for strategies information, Failures of Past Decision-Supporting System, Operational Versus Decision-Supporting System, Data Warehousing- The only Viable Solution, data Warehouse Defined.

The Building Blocks: Defining Features, Data Warehouse and Data Marts, Overview of the Components, Metadata in the Data Warehouse.

Trends in Data Warehousing: Continues Growth in Data Warehousing, Significant Trends, Emergence of Standards.

Planning and Planning Management: Planning your Data Warehousing, The Data Warehouse Project, The project team, Project Management Considerations.

Defining the Business Requirement: Dimension Analysis, Information Package- A New Concept, Requirements Gathering Methods, Requirements Definition: Scope and content.

Requirements as the Driving force for Data Warehousing: Data Design, The Architectural Plan, Data Storage Specification, and Information Delivery Strategy. **(9)**

Unit – II The Architectural Component: Understanding Data Warehouse Architecture, Distinguishing Characteristics, Architectural framework, Technical Architecture.

Infrastructure as the Foundation for Data Warehousing: Infrastructure Support Architecture, Hardware Operational System, Database Software, Collection of Tools.

The Significant Role of Metadata: Why Metadata is Important, Metadata Types by Functional Areas, Business Metadata, How to Provide Metadata. **(9)**

Unit – III Principles of Dimensional Modeling: From Requirement to Data Design, The STAR Schema, STAR Schema keys, Advantages of STAR Schema.

Dimensional Modeling: Updates to the Dimensional Tables, Miscellaneous Dimensions, The Snowflake Schema, Aggregate Fact Tables, and Families of STARS.

Data Extraction, Transformation, and Loading: ETL overview, Data Extraction, Data Transformation, Data Loading, ETL Summary.

Data Quality: Why data is quality critical, Data Quality Challenges, Data Quality Tools, Data Quality Initiative. **(9)**

Unit – IV Matching Information to the Classes of Users: Information from the Data Warehouse, Who will Use the Information?, Information Delivery, Information Delivery Tools.

OLAP in the Data Warehouse: Demand for Online Analytical Processing, Major Features and Functions, OLAP Models, OLAP Implementation Consideration.

Data Warehousing and the Web: Web-Enabled Data Warehouse, Web-Based Information Delivery, OLAP and the Web, Building a Web- Enabled Data Warehouse. **(9)**

Unit – V The Physical Design Process: Physical Design Steps, Physical Design Considerations, Physical Storage, Indexing the Data Warehouse, Performance Enhancement Techniques.

Data Warehouse Deployment: Major Deployment Activities, Considerations for a Pilot, Security, Backup and Recovery.

Growth and Maintenance: Monitoring the Data Warehouse, User Training and Support, Managing the Data Warehouse. **(9)**

Textbooks:

1. Data warehousing fundamentals, first edition, paulraj ponniah, Wiley.

Reference Books:

1.Data Warehousing in the real world, low price edition, Sam Anahory, Dennis Murray, Pearson Education.

2. Data warehousing Tool kit

DATA WAREHOUSING

Model Paper

I. Answer ANY FIVE Questions of the following 5 X 20=100 Marks

1. a) Compare operational versus decision support systems.
   b) Define the features involved in building a data warehouse.

2. a) Write about Data Fusion and Data Integration.
   b) Write about the requirements gathering methods in defining the Business.

3. a) Discuss about the three major areas in data warehouse architecture.
   b) Explain the importance of metadata in a data warehouse environment.

4. a)Write about the multidimensional data model. Explain, how is it used in data warehousing?
   b) Explain star schema with an example.

5. a) List out the ETL requirements and steps.
   b) Compare and contrast between E-R modeling and Dimensional modeling.

6. a)List out OLAP operations in multidimensional data model.
   b) Write about the Web-OLAP approaches.

7. a) Compare and contrast between ROLAP and MOLAP.
   b) Discuss about the dimensional analysis of OLAP in data warehouse.

8. a) Write about the steps in physical design process.
   b) Explain the major deployment activities in data warehouse.

DISTRIBUTED DATABASE SYSTEMS **L-T-P: 3-0-0(3)**

Answer any five of the following **(5*20=100)**

1. (a) what is a Distributed database system? **(10M)**

   (b) Explain the promises of DDBSs ? **(10M)**

2. (a) What is normalization? Explain all normal form with example. **(10M)**

   (b) Describe following operation in context of relation algebra

   (1) Selection

   (2) Intersection **(10M)**

3. (a) Explain the Client server architecture for Distributed DBMS with figure. **(10M)**

   (b) Explain peer-to-peer distributed systems. **(10M)**

4. (a) Explain top-down and bottom-up design strategies. **(10M)**

   (b) What is allocation? List the information requirements during allocation. **(10M)**

5. (a) What is query processing in a relational database? Explain in detail with an example. How does it differ from distributed query processing? **(10M)**

   (b) Explain Layers of Query Processing. **(10M)**

6. (a) Describe the Transaction ? **(10M)**

   (b) Explain various types of transaction in detail. **(10M)**

7. (a) Explain Parallel Database System Architectures ? **(10M)**

   (b) Explain about Load Balancing in Parallel Database System Architectures. **(10M)**

8. (a) Describe Abject Management in detail. **(10M)**

   (b) Explain Database interoperability. **(10M)**

DISTRIBUTED DATABASE SYSTEMS **L-T-P: 3-0-0(3)**

UNIT I

Introduction: Distributed Data processing, Distributed database system (DDBMSS), Promises of DDBMSs, Complicating factors and Problem areas in DDBMSs,

Overview Of Relational DBMS Relational Database concepts, Normalization, Integrity rules, Relational Data Languages, Relational DBMS **(9)**

UNIT II

Distributed DBMS Architecture: DBMS Standardization, Architectural models for Distributed DBMS, Distributed DBMS Architecture

Distributed Database Design: Alternative design Strategies, Distribution design issues, Fragmentation, Allocation.

Semantic Data Control: View Management**, Data** security, Semantic Integrity Control **(9)**

UNIT III

Overview Of Query Processing: Query processing problem, Objectives of Query Processing, Complexity of Relational Algebra operations, characterization of Query processors, Layers of Query Processing

Introduction To Transaction Management: Definition of Transaction, Properties of transaction, types of transaction **(9)**

UNIT IV

Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanisms, locking bases concurrency control algorithms.

Parallel Database Systems: Database servers, Parallel architecture, Parallel DBMS techniques, Parallel execution problems, Parallel execution for hierarchical architecture. **(9)**

UNIT V

Distributed Object Database Management systems: Fundamental Object concepts and Object models, Object distribution design. Architectural issues, Object management, Distributed object storage, Object query processing. Transaction management.

Database Interoperability: Database Integration, Query processing, **(9)**

Textbooks:

1. Principles of Distributed Database Systems, Second Edition, M.Tamer Ozsu Patrick Valduriez

Reference Books:

1.Distributed Databases principles and systems, StefanoCeri,Giuseppe Pelagatti,TatamcGrawHill

BRAIN COMPUTER INTERACTION

SYLLABUS

1. **INTRODUCTION:** Introduction to Brain-Computer Interaction (BCI), History, forms and features of brain signals, technologies used; issues in BCI.
2. **BRAIN AREAS AND FUNCTIONS:** Cerebellum, hippocampus, parietal region, amygdale, Broca's area, somatic sensory cortex, occipital lobe, olfactory bulb, frontal lobe, thalamus, motor cortex, auditory cortex
3. **APPLICATIONS OF BCI TO DISEASES AND DISORDERS:** stroke, epilepsy, spinal cord injury, Alzheimer's disease, ADHD, bio-mimetics, amyotrophic lateral sclerosis (ALS), motor or communication dysfunction, control of emotions, personality disorders, schizophrenia
4. **BRAIN DATA ACQUISITION:** Brain sensor technologies: invasive and non invasive techniques of data acquisition; scanning technologies: fMRI, MEG, LFP; methods for volition acquisition
5. **DATA PRE-PROCESSING MODELS:** Wiener solution for finite impulse-response filter, Kalman filter, Gaussian distribution, Monte Carlo sampling, Poisson distribution assumption, Fast Fourier Transform (FFT-based) band-pass filtering, Laplacian filters
6. **DATA PROCESSING & VISUALIZATION MODELS:** Least mean square (LMS) algorithm, time delay neural networks (TDNN), support vector machine (SVM), regression, Volterra series expansions in Hilbert spaces, Laguerre polynomials, Kautz functions, Bayesian networks, Monte Carlo sequential estimation algorithm, principal component analysis (PCA), independent component analysis (IDA)
7. **BCI IN OTHER AREAS:** Brain controlled gaming, navigation of air/space crafts, robotics, bio-inspired multimedia/virtual reality

TEXT BOOK

Brain Computer Interfaces: An International Assessment of Research and Development Trends, T. W. Berger, J. K. Chapin, G. A. Gerhardt, D. J. McFarland, J. C. Principe, W. V. Soussou, D. M. Taylor and P. A. Tresco, Springer, 2008; available for download at http://books.google.co.in/books/about/Brain_Computer_ Interfaces.html?id=9bYkk4WoPRMC&redir_esc=y

REFERENCE BOOKS

1. Explaining the Brain: Mechanisms and the Mosaic Unity of Neuroscience, Carl F. Craver, Clarendon Press, Oxford, 2007
2. Matlab for Neuroscientists: An Introduction to Scientific Computing in Matlab, Marc Benayoun, T. I. Baker, A. S. Dickey, N. G. Hatsopoulos, 2009, Elsevier
3. Brain Computer Interface Systems - Recent Progress and Future Prospects, available for download at http://www.intechopen.com/books/brain-computer-interface-systems-recent-progress-and-future-prospects

WEB REFERENCES

1. Berlin Brain Computer Interface (BBCI) website, http://www.bbci.de/
2. g.tec (Guger Technologies) website, http://www.gtec.at/
3. Multi Channel Systems MCS GmbH website, http://www.multichannelsystems.com/
4. Schroeder, M., and R. Cowie, HUMAINE Emotion Research 2007. Website at http://emotion-research.net
5. Takanishi, A., S. Hashimoto, P. Dario, and M.C. Carrozza, Robocasa Project. Website at http://www.robocasa.net

BRAIN COMPUTER INTERACTION

5 questions x 8 marks = 40 marks

1. Describe the working of electrocorticography (ECoG).

2. Current research on BCI faces with the basic issue of synchronization due to varying signal speeds, i.e., the machine to be in sync with human candidate as well as vice versa. Do you think that a model wherein both machine and the human brain should tend to interact with one other? If yes, what kind of communication/synchronization do you expect between the two?

3. What types of sensors are available for recording the brain waves? Describe typical specifications of a BCI experimental setup. What methods are required for simultaneous processing of multiple signals?

4. Describe the following terms:

a) Amygdala

b) Broca's area

c) Monte Carlo method

d) Kalman filter

5. List the broad classes of filtering techniques that can be applied to conditioning of brain signals. Give examples of each class to substantiate your listing.

6. Which is better for analysis in BCI systems – EEG or ECoG and why?

7. Compare and contrast the invasive and non invasive methods of data acquisition in BCI.

8. Explain as to what do the EEG signals carry, and what strategy should be applied to understand them?

SOFTWARE ENGINEERING

L-T-P: 3-0-0(3)

Unit – I

Software and Software Engineering: Nature of software, software application domains, unique nature of web applications, software engineering, software process, software engineering practice, software myths. **Process Models:** Generic process model, prescriptive process models, specialized process models, unified process, personal and team process models, product and process. **Agile development:** Agility, agile process, extreme programming and other agile process models. (9)

Unit – II

Modeling: Core principles, principles that guide each frame work activity

Understanding Requirements: Identify stakeholders, Recognizing multiple view points, Eliciting requirements, building requirement model, negotiating requirements, validating requirements. **Requirement Modeling:** Analysis, Rules of Thumb, domain analysis, requirement modeling approaches, scenario based modeling, Data modeling concepts, Flow oriented modeling, creating behavioral model, patterns for requirement modeling, (9)

Unit – III

Design concepts: Design process, Design concepts, design model. **Architecture Design:** Software architecture, architectural styles, architectural design, assessing alternative architectural designs, architectural mappings using data flow. **Component-level design:** Designing class based components, conducting component level design. (9)

Unit – IV

User interface design: The golden rules, user interface analysis and design, interface analysis, interface design steps**. Quality concepts:** software quality, software quality dilemma, achieving software quality. **Software quality assurance:** Elements of software quality assurance, sqa tasks, goals. Formal approaches. (9)

Unit – V

Software testing strategies: A strategic approach to software testing, strategic issues, test strategies for conventional software, validation testing, system testing**.** (9)

Text book:

1. Roger S.Pressman ,"Software Engineering – A Practitioner's Approach 7th Edition 2010, Mc Graw Hill.

Reference Book:

1) Ian Sommerville,'Software Engineering', Sixth Edition,2001,Pearson Education.

SOFTWARE ENGINEERING

Write any five questions Time: 3 hrs

All questions carry equal marks 5*20=100

1) a) Elucidate the layered approach used in Software Engineering.

b) Differentiate Evolutionary process models.

2) a) How the tasks are involved in Requirements Engineering.

b) What is RMMM Strategy? Explain the issues involved in it.

c) Enlighten the framework activities involved in the software development process.

3) a) What is Use-Case? Discuss the method of developing Use-Cases.

b) Explain the step by step process of creating a Data Flow Model.

4) a. Examine the Flow oriented modeling with examples.

b. Carry out the analysis for Safe Home Application. Identify the potential classes in this application and explain how actual classes are segregated from potential classes

5) a. State the Set of basic principles that can be applied to design user interface.

b. What are the Elements of software quality assurance?

6) Consider the following two examples of software projects: developing a conventional compiler for known programming language (e.g., C) for a new machine and developing an application to automate a doctor's office. Which of the two is likely to call for a waterfall life cycle development style? Why? What are the likely risks in the two examples and how can the chosen development life cycle model face the risks?

7) a) Design an activity diagram for a safe home project for the requirement of

Camera views function when the camera is accessed via internet?

b) How Garvin's quality dimensions improves the quality of the software?

Demonstrate with a suitable example?

8) What is agile development model? Explain about different methodologies in agile process model.

WEB SERVICES

L-T-P: 3-0-0(3)

UNIT1. INTRODUCTION

Role Of XML - XML and The Web - XML Language Basics - SOAP - Web Services - Revolutions Of XML - Service Oriented Architecture (SOA). **(9)**

UNIT 2. XML TECHNOLOGY

XML - Name Spaces - Structuring With Schemas and DTD - Presentation Techniques - Transformation - XML Infrastructure. **(9)**

UNIT 3. SOAP

Overview Of SOAP - HTTP - XML-RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns And Faults - SOAP With Attachments. **(9)**

UNIT 4. WEB SERVICES

Overview - Architecture - Key Technologies - UDDI - WSDL - ebXML - SOAP And Web Services In E-Com - Overview Of .NET And J2EE. **(9)**

UNIT 5. XML SECURITY

Security Overview - Canonicalization - XML Security Framework - XML Encryption - XML Digital Signature - XKMS Structure - Guidelines For Signing XML Documents - XML In Practice. **(9)**

TEXT BOOKS:

1. Frank. P. Coyle, XML, Web Services And The Data Revolution, Pearson Education, 2002.

REFERENCES:

1. Ramesh Nagappan , Robert Skoczylas and Rima Patel Sriganesh, " Developing Java Web Services", Wiley Publishing Inc., 2004.

2. Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson Education, 2004.

2. McGovern, et al., "Java Web Services Architecture", Morgan Kaufmann Publishers,2005.

WEB SERVICES

Write any five questions Time: 3 hrs

All questions carry equal marks 5*20=100

1) a) What is service oriented architecture? Does web services follow SOA? Justify.

b) Explain the business and technical motivations for web services.

2) a) Web services is basically based on XML. Name the three technologies of web services And briefly describe what is used for.

b) Create the XML representations of the UDDI elements business entity, business service, binding template and model for the bus transportation company and its bus service. Explain why UDDI can be described as being both a name service and a directory service, mentioning the types of the enquiries that can be made.

3) Explain about SOAP with an example of Industry usage. State business reasons for using SOAP. What are the advantages of SOAP over standard HTTP requests.?

4) a) Explain the XML Representation technologies using XSLT and XLink.

b) Write short notes on

i) Vector Data ii) Raster Data

5) a. Explain the exchange of information between applications in a distributed environment?

b. Compare J2EE and .NET framework in the context of web services.

c. Write a program to illustrate web service in .NET environment.

6) a. Explain the terms latency, reliability and QOS metric.

b. Write a complete set of programs to illustrate SOAP message passing.

c. Explain the SOAP message structure and illustrate SOAP with attachment.

7) a. Create a DTD for mark statement of a student. Write a program to retrieve the elements and attributes of the XML document and display the mark statement.

b. Write an XML document to illustrate the elements, attributes and CDATA section.

8) a. Explain XML security framework.

b. Explain how static and dynamic system interfaces can be implemented.

c. Write an XML document to illustrate XSL, parameter entities.

DIGITAL IMAGE PROCESSING **L-T-P: 3-0-0(3)**

UNIT I: Introduction: Digital Image Processing, Fundamental steps in Digital Image Processing, Components of an Image Processing System. **Digital Image Fundamentals:** Visual Perception, Image sensing & Acquisition, Image Sampling & Quantization, Some Basic Relationships between Pixels. **(9)**

UNIT II: Image Enhancement in the Spatial Domain: Some basic Gray level Transformations, Histogram Processing, Enhancement using Arithmetic/Logic Operations, Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement methods. **(9)**

UNIT III: **Image Enhancement in the Frequency Domain**: Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphism Filtering, Implementation. **(9)**

UNIT IV: Image Restoration: Image Degradation/Restoration Process, Linear, Position-Invariant Degradations, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering. **Wavelets and MultiResolution Processing** : MultiResolution Expansions, Wavelet Transforms in One dimension, The Fast Wavelet Transform, Wavelet Transforms in Two Dimensions. **(9)**

UNIT V: Image Compression: Image Compression Models, Error-Free Compression, Lossy Compression, Image Compression Standards. **Image Segmentation:** Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation. **(9)**

Text Book:

1.Rafael C.Gonzalez, Richard E. Woods; "Digital Image Processing ' Addison Wesley Pubs(Second Edition),2007.

Reference Books :

1. Milan Sonka, Vaclav Hlavac, Roger Boyle Image Processing. Analysis, and Machine Vision(Second Edition,2003).
2. A.K.Jain, 'Fundamentals of Digital Image Processing' PHI,`1999.

DIGITAL IMAGE PROCESSING

Answer any Five questions…

Max marks : 5 X 20 =100

1. a)With a block diagram explain different component of a image processing system.
b) What do you mean by resolution of an image? Relate resolution with processing time and communication cost.

2.Suppose that a digital image is subjected to histogram equalization. Show that a second pass of histogram equalization will produce exactly the same result as the first pass.

3. Develop an algorithm for converting a one-pixel-thick m-path to a 4-path.
b) Show that the boundary of the region is a closed path.

4. Discuss minimum mean square error filtering.
b) Compare minimum mean square error filtering with inverse filtering.
c) What is gray-level interpolation? Give one scheme for gray-level interpolation.

5. Why do we perform image processing in frequency domain although images are generally represented in spatial domain?
b) Give a general procedure to implement filtering in frequency domain.
c) Discuss the usefulness of FFT in digital image processing.

6. a)What is the result of applying thresholding to an image? How do we choose thresholding level(s)? Give a specific application of thresholding.
b) What do you mean by registration of an image? Give its applications.

7. Why is image enhancement different from image restoration? What is color interpolation or de-mosaicing?
b) What do you understand by Pseudo Color image processing?

8. a) What do you mean by compression of an image? Compare lossless and lossy compressions with examples.
b) What is Run Length Encoding (RLE)? Explain with an example.
c) Give basic encoding method for transform based image compression.

PROGRAMMING PARADIGMS

L-T-P: 3-0-0(3)

UNIT-I:

Language Design Issues: Introductory concepts of programming paradigms, History and role of programming languages, Attributes of a good language, Language Paradigms, Language Standardization, Programming Environments, Evolution of major programming languages, Syntax and semantics.

Names, Binding, Type Checking, and Scopes: Introduction, Names, Variables, The Concept of Binding, Type Checking, Strong Typing, Type Compatibility, Scope, Scope & Lifetime, Referencing Environments, named Constants. **(9)**

UNIT-II:

Data Types: Introduction, Primitive Data Types, Character String Types, User – Defined Ordinal Types, array Types, associate Arrays, Record Types, Union Types, pointer & Reference Types.

Expressions and Assignment Statements: Introduction, Arithmetic Expressions, Overloaded Operators, Type Conversions, Relational & Boolean Expressions, Short – Circuit Evaluation, Assignment Statements, Mixed – mode Assignment. **(9)**

UNIT-III:

Statement-Level Control Structure: Introduction, Selection Statements, iterative Statements, Unconditional Branching, Guarded Commands.

Subprograms: Introduction, Fundamentals of Subprograms, Design Issues for Subprograms, Local Referencing Environments, Parameter – Passing Methods, Parameters That Are Subprogram Names, Overloaded Subprograms, Generic Subprograms, Design Issues for Functions, user-Defined Overloaded Operators, Co routines**(9)**

UNIT-IV:

Abstract Data Types And Encapsulation Constructs: The Concept of Abstraction, Introduction to Data Abstraction, Design Issues for Abstract Data Types, Language Examples, Parameterized Abstract Data Types, Encapsulation constructs, Naming Encapsulations.

Support for Object-Oriented Programming: Introduction, Object-Oriented Programming, Design Issues for Object-Oriented Languages, Support for Object-Oriented Programming in Smalltalk, Support for Object-Oriented Programming in c++, Support for Object-Oriented Programming in Java, for Object-Oriented Programming in C#, for Object-Oriented Programming in Ada 95, The Object Model of JavaScript, Implementation of Object-Oriented Constructs. **(9)**

UNIT-V:

Functional Programming Languages: Introduction, Mathematical; Functions, Fundamentals of Functional Programming Languages, The First Fundamental Programming Language, An Introduction to Scheme, common LISP, ML, Haskell, Applications of Functional Languages, A Comparison of Functional & Imperative Languages.

Logic Programming Languages: Introduction, A Brief Introduction to Predicate Calculus, Predicate Calculus & Proving Theorems, An Overview of Logic Programming, The Origins of Prolog, the Basic Elements of Prolog, The Deficiencies of Prolog, applications of Logic Programming. **(9)**

Textbooks:

1. Concepts of Programming Languages, 8th Edition. Robert W. Sebesta.
   Copyright © 2008 Pearson Education, Inc. (ISBN: 9780321493620).

Reference Books:

1. Programming Language Pragmatics, 3nd ed., Michael Scott, Morgan Kaufmann Publishers, 2009.
2. Programming Languages Design and Implementation, Forth Edition, Terrence W. Pratt and Marvin V. Zelkowitz, Prentice Hall (ISBN: 978-81-203-2035-2).
3. Programming Languages – Concepts & Constructs, Ravi Sethi, Pearson Education
4. Programming languages - Glezzi, 3/E, john wiley
5. Programming Languages Design and Implementation, Pratt and Zelkowitz, `4th edition, PHI/Person education.
6. Structure and Interpretation of Computer Programs, Harold Abelson and Gerald Jay Sussman with Julie Sussman, Available at http://www-mitpress.mit.edu/sicp/full text/book/book.html
7. Prolog Programming: A first course by Paul Brna. Available at http://computing.unn.ac.uk/staff/cgpb4/prologbook

Programming Paradigms

Time: 3 hrs Max Marks: 100

Answer any FIVE QUESTIONS.

1) [4*5=20M]

a. How is allocation done when explicit heap-dynamic variables are used?
b. Differentiate between static and dynamic binding.
c. Give any two disadvantages of using pass by name.
d. What is shallow binding?

2. a) Distinguish Functional programming with logic programming. [10M]

b) What is meant by syntax and semantics of a language? Explain their importance in programming. [10M]

3. a) Define a loop? How will you handle special cases in loops? [10M]

b) What are pre conditions, invariants and post conditions? give their role in loops. [10M]

4. a) Briefly explain enumeration and sub range data type. Do they belong to primitive data types or user defined data types? Justify. [10M]

b) Differentiate records from variant records with suitable examples.[10M]

5. a) Define static binding and dynamic binding. Pascal supports both. Justify with suitable examples. [10M]

b) Briefly explain procedure declaration in Pascal with examples.[10M]

6. a) What a macro processor does? Explain macro pre-processors in C. [12M]

b) How will you allocate static variables at compile time? [8M]

7. a) What are Exceptions? How they are handled in ML? [8M]

b) Give applications of functional programming languages. Compare and contrast functional and imperative languages. [12M]

8. Write short notes on following

a) Syntax charts b) Templates

c) Imperative programming d) Java threads [4*5=20M]

ARTIFICIAL INTELLIGENCE

Syllabus:

Introduction to AI, Problems, Problem Spaces and Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs. **Heuristic Search Techniques:** Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis. **Knowledge Representation Using Predicate Logic:** Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution. **Representing Knowledge Using Rules:** Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge. **Weak slot-and-filler structures**: Semantic Nets, Frames, **Strong slot-and-filler structures**: Conceptual dependency, Scripts. **Connectionist models:** Hopfield Networks**,** Perceptrons, Back Propagation Networks, Applications of Neural networks. **PROLOG Language:** Facts, Objects and predicates, Variables, Rules, Input and Output, Arithmetic Operations, Cut, Fail, Recursion, String operations, Dynamic databases.

Text Books:

1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3nd Edition, (Tata McGraw Hill Edition) Reprint 2008
2. Carl Townsend, 'Introduction to TURBO PROLOG', BPB Publications. 2011

Reference Books:

1. Patrick Henry Winston, 'Artificial Intelligence', Pearson Education, 2003
2. Russel and Norvig, 'Artificial Intelligence', Pearson Education, PHI, 2003

Artificial Intelligence

Model Question paper

All Questions carry equal marks — Max. Marks: 100

Answer ANY five questions — 5 X 20=100M

1)		Explain Problem Characteristics and Production system characteristics with suitable examples.	20M
2)	a)	Explain Hill Climbing.	10M
	b)	Explain Means-Ends Analysis with a suitable example.	10M
3)		Explain Resolution technique with a suitable example.	20M
4)	a)	What is Logic Programming? Briefly describe it with suitable examples.	10M
	b)	Compare Forward Reasoning with Backward Reasoning	10M
5)		Explain Semantic Nets and partitioned Semantic Nets	20M
6)		Explain Back Propagation Networks	20M
7)	a)	Explain Scripts	10M
	b)	Describe various Applications of Neural networks	10M
8)	a)	Briefly describe the Input and Output operations in PROLOG	10M
	b)	Briefly describe the String operations in PROLOG	10M

SOFT COMPUTING

Syllabus

Intelligent systems and soft computing: Intelligence systems, Knowledge-based systems, knowledge representation and processing, soft computing. **Fundamentals of Fuzzy Logic Systems:** Fuzzy sets, Fuzzy logic operations, generalized operations, Fuzziness and fuzzy resolution, relations, composition and interface, considerations of fuzzy decision- making. **Fuzzy logic control: B**asics of fuzzy control, Fuzzy control architecture, Properties of fuzzy control, robustness and stability. **Fundamentals of artificial neural networks:** Learning and acquisition of knowledge, features of Artificial neural networks, fundamentals of connectionist modeling. **Major classes of neural networks**: The multi-layer perceptrons, radial basis function networks, Kohonen's self-organizing network, The Hopfield network, industrial and commercial application of ANN. **Dynamic neural networks and their applications to control and chaos prediction:T**raining algorithms, fields of applications of RNN, dynamic neural networks for identification and control, neural network–based control approaches, dynamic neural networks for chaos time series, Artificial neural networks for chaos predictions. **Neuro Fuzzy Systems**: Architecture of Neuro fuzzy systems, construction of Neuro fuzzy systems. **Evolutionary computing:** Over view of Evolutionary computing, Genetic algorithms and optimization, the schema theorem: the fundamental algorithm of Genetic algorithms, operations, integration of Genetic algorithms with neural networks, integration of Genetic algorithms with fuzzy logic, known issues in Genetic algorithms, population-based incremental learning, ES applications

Textbook:

1. Fakhreddine O. Karry, Clarence De Silva, "Soft Computing and Intelligent systems Design Theory, Tools and Applications", Pearson, 2009

Reference Books:

1. S N Sivanandam, S N Deepa, "Principles of Soft Computing", Wiley India, 2008
2. Laurene Fausett, "Fundamentals of Neural Networks", Pearson, 2004.
3. Timothy J Ross "Fuzzy Logic with Engineering Applications", 3rd Edition, Wiley, 2010.
4. Bart Kosko, "Neural Networks and Fuzzy Systems", PHI, 2004

Soft Computing

Model Question paper

All Questions carry equal marks Max. Marks: 100

Answer ANY five questions 5 X 20=100M

1)		Describe different types of knowledge based systems	20M
2)		Compare and contrast "fuzziness" and uncertainty.	20M
3)		Write the methods for defuzzification of fuzzy control inference	20M
4)		Explain Multi-layer Perceptron Neural Networks	20M
5)		Give an analysis on how Neural Networks can be used for process monitoring and optimal control	20M
6)	a)	Describe the architecture of the Recurrent networks	10M
	b)	Draw a neat sketch on neural network acting as a supervisory controller	10M
7)		Explain the construction of Neuro-Fuzzy system.	20M
8)		Explain Genetic algorithms with suitable examples.	20M

SOFTWARE TESTING

Syllabus:

Principles of Testing; Software Development Life Cycle Models – Phases of Software Project – Quality, Quality Assurance and Quality Control - Testing, Verification and Validation – Process Model to Represent different Phases **White Box Testing**: Static Testing – Structural Testing – Challenges **Black Box Testing:** Need and types of black box testing **Integration Testing**: Integration Testing as a Type of Testing – Integration Testing as a phase of Testing – Scenario Testing – Defect Bash. **System and Acceptance Testing**: Overview – Functional Versus Non-Functional – Functional System Testing & Non-Functional – Acceptance Testing. **Performance Testing:** Factors governing performance testing, methodology for performance testing, tools for performance testing and process for performance testing **Regression Testing:** Introduction –Types – When to do Regression Testing – How to do Regression Testing – Best Practices in Regression Testing. **Ad hoc Testing:** Overview – Buddy Testing – Pair Testing – Exploratory Testing – Iterative – Agile and Extreme Testing – Defect Seeding. **Usability and Accessibility Testing**: Approach to Usability – When to do Usability – How to achieve Usability – Quality Factors for Usability – Aesthetics Testing – Accessibility Testing – Tools for Usability – Usability Lab Setup – Test Roles for Usability. **Common People Issues:** Perceptions and Misconceptions about Testing – Comparison between Testing and Development, **Test planning, management, process and reporting; Software Test Automation:** Terms used in Automation – Skills needed for Automation – What to Automate, Scope of Automation – Design and Architecture for Automation **Test metrics and measurements**: Project metrics, progress metrics and productivity metrics.

TEXT BOOKS:

1. Paul Ammann and Jeff Offutt, "*Introduction to Software Testing*", Cambridge Press, 2008.
2. Srinivasa Desikan & Gopalaswamy Ramesh, "*Software Testing – Principles and Practices*", Pearson Education, 2007.

REFERENCES:

1. Ilene Burnstein, "*Practical Software Testing*", Springer 2003
2. William E. Lewis, "*Soft ware Testing and Continuous Quality Improvement*", 3rd Edition CRC press 2009.
3. Jeff Tian, "*Software Quality Engineering Testing, Quality Assurance, and Quantifiable Improvement*", John Wiley 2005.
4. Ron Patton, "*Software Testing*", 2nd Edition, Pearson Education, 2005.
5. Dirk Meyerhoff, BegonaLaibarra, "*Software Quality and Software Testing in Internet Times*", Springer, 2002.
6. S. Dick, A. Kandel, "*Computational Intelligence in Software quality Assurance*", World Scientific, 2005.

Software Testing

Model Question paper

All Questions carry equal marks Max. Marks: 100

Answer ANY five questions 5 X 20=100M

1) Describe the basic principles of testing. Give your own example for each testing principle explaining how it helps the software testing process.

2) a) Compare and Contrast Water Fall Model and V- Model.
   b) Illustrate the importance of testing from day 1 in the Software Development process and explain how defects from early phases add to the costs.

3) Explain the advantages and disadvantages of Top-down Integration and Bottom-Up Integration testing with the help of neat diagrams.

4) Prove that "Code Coverage Testing is the best means for Structural Testing" with suitable examples.

5) Describe the characteristics of the Requirements Based Testing with suitable examples.

6) Describe various methods for testing Non-functional requirements during System Testing.

7) Explain the various steps and guidelines for conducting Performance Testing in an effective manner.

8) a) Demonstrate the functioning of Test Automation which addresses and solves problems associated with testing.
   b) Classify the Product Metrics on the basis of "What they measure" and "On what area they focus" in a detailed way.

CRYPTO ANALYSIS

UNIT 1
CLASSIC CIPHERS: Introduction, Good Guys And Bad Guys, Terminology, Selected Classic Crypto Topics.
WORLD WAR II CIPHERS: Introduction, Enigma, Purple, Sigaba. **(9)**

UNIT 2
STREAM CIPHERS: Introduction, Shift Registers, ORYX, RC4, PKZIP.
BLOCK CIPHERS: Introduction, Block Cipher Modes, Feistel Cipher, Hellmans Time-Memory Trade-off, CMEA, Akelarre, FEAL**(9)**

UNIT 3
HASH FUNCTIONS: Introduction, Birthdays and Hashing, MD4, MD5. **(9)**

UNIT 4
PUBLIC KEY SYSTEMS: Introduction, Merkle-Hellman Knapsack, Diffie-Hellman Key Exchange, Arithmetica Key Exchange, RSA, Rabin Cipher, NTRU Cipher, ElGamal Signature Scheme**(9)**

UNIT 5
PUBLIC KEY ATTCAKS: Introduction, Factoring Algorithms, Discrete Log Algorithms, RSA Implementation Attacks. **(9)**

TEXTBOOK:
1. Appllied Cryptanalysis Breaking Ciphers in the Real World by Mark Stamp, Richard M. Low John

REFERENCES:
1. Applied Cryptography Seconf Edition Bruce Schneier Wiley India Edition
2. Cryptography and network Security, Fourth edition, William Stallings, PHI/Pearson

CRYPTO ANALYSIS

Model Paper

1. A) Explain some of the Ancient Ciphers, Machine Ciphers

   B) Explain classical monoalphabetic cryptography Technique

2. A) What do you mean by Cryptography? Explain the different type of ciphers

   B) Explain Feistel block Cipher

3. A) Explain Key recovery attacks on block ciphers

   B) Construction the Data Encryption Standard function

4. A) Explain SHA algorithm

   B) What are the requirements of a digital signature? Explain.

5. A) Explain message digest generation using MD-5

   B) Define the Diffe Hellman (DH) secret key exchange (SKE) protocol

6. A) Explain NTRU polynomial public key crypto system?

   B) Explain ElGamal Signature Scheme and building with EIGamal/DSS

7. A) How Lenstra's elliptic curve factoring algorithm works with elliptic curves?

   B) What is the main idea of Factoring using elliptic curve?

8. A) Explain Attacks Against Digital Signatures

   B) Explain the Discrete Logarithm Function

ROBOTIC MODELING ANALYSIS AND CONTROL

L-T-P
3-0-0

Prerequisite: Nil

Unit I

Introduction to Robots : Applications, Economic considerations and motivations, What is a robot? Robots and their analog to human senses, intelligence, and motor function. (9)

Unit II

Manipulators & Configurations: Robot work space. Manipulator specifications and criteria for selection; Current limitations of commercially available systems, Types of control, Typical tasks and performance demands, Resolution, repeatability, and accuracy (9)

Unit III

Manipulator kinematics: Homogeneous transformations and matrix methods, Joint, world, and tool coordinate system

Definition of hand orientations, Euler angles; directional cosines; roll, pitch, yaw, Link transformations, Manipulator inverse kinematic solutions

Singularities, Role of inverse kinematics in position controlled robots, Velocity and path control: the Jacobian, Computation of the Jacobian (9)

Unit IV

Task primitives and programming: Computational aspects, Case study, Tracking moving objects, Programming languages, Determining path trajectories:

Splines: cubics and quintics, Static forces and their control - The role of the Jacobian (9)

Unit V

Manipulator dynamics: Two-dimensional Lagrange solution, Inertial effects and transmissions

Manipulator control: Servo control loops, Position control vs. force control, System bandwidth, Hybrid control, impedance control, and comparison of architectures (9)

Text Books:

1. M.W. Spong, M. Vidyasagar, Robot Dynamics and Control, John Wiley,
2. Mark W. Spong, Seth Hutchinson, and M. Vidyasagar, *Robot Modeling and Control*,

Reference Books:

3. Robot Arm Kinematics : S.K.Saha, and Himanshu Choudary, Springer Publications
4. Robot Analysis: Asitava Ghosal, Tata Mc Graw Hill

K L University
Department of EEE
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

ELECTRICAL MACHINE MODELING AND ANALYSIS
SYLLABUS

Unit I: Basic concepts of Modeling

Basic Two-pole Machine representation of Commutator machines, 3-phase synchronous machine with and without damper bars and 3-phase induction machine, Kron's primitive Machine - voltage, current and Torque equations.

DC Machine Modeling

Mathematical model of separately excited D.C motor – Steady State analysis-Transient State analysis Sudden application of Inertia Load-Transfer function of Separately excited D.C Motor- Mathematical model of D.C Series motor, Shunt motor-Linearization Techniques for small perturbations

Unit II: Reference frame theory

Real time model of a two phase induction machine- Transformation to obtain constant matrices three phase to two phase transformation-Power equivalence.

Dynamic modeling of three phase Induction Machine

Generalized model in arbitrary reference frame-Electromagnetic torque-Derivation of commonly used Induction machine models- Stator reference frame model-Rotor reference frame model-Synchronously rotating reference frame model-Equations in flux linkages-per unit model

Unit III: Small Signal Modeling of Three Phase Induction Machine

Small signal equations of Induction machine-derivation-DQ flux linkage model derivation-control principle of Induction machine.

Symmetrical and Unsymmetrical 2 phase Induction Machine

Analysis of symmetrical 2 phase induction machine-voltage and torque equations for unsymmetrical 2 phase induction machine-voltage and torque equations in stationary reference frame variables for unsymmetrical 2 phase induction machine-analysis of steady state operation of unsymmetrical 2 phase induction machine- single phase induction motor - Cross field theory of single-phase induction machine.

Unit IV: Modeling of Synchronous Machine

Synchronous machine inductances –voltage equations in the rotor's dq0 reference frame-electromagnetic torque-current in terms of flux linkages-simulation of three phase synchronous machine- modeling of PM Synchronous motor.

Unit V: Dynamic Analysis of Synchronous Machine

Dynamic performance of synchronous machine, three-phase fault, comparison of actual and approximate transient torque characteristics, Equal area criteria

Text Books:

1. R. Krishnan, "Electric Motor Drives - Modeling, Analysis& control", Pearson Publications, 1st edition, 2002.

2. P.C.Krause, Oleg Wasynczuk, Scott D.Sudhoff, "Analysis of Electrical Machinery and Drive systems", IEEE Press, Second Edition.

Reference Books:

1. P.S.Bimbra, "Generalized Theory of Electrical Machines" Khanna publications, 5th edition-1995
2. Dynamic simulation of Electric machinery using MATLAB / Simulink –Chee Mun Ong-
Prentice Hall.

ELECTRICAL MACHINE MODELING AND ANALYSIS
Model Question Paper

Time: 3hrs **Max Marks:100**

Answer any five questions **5 X 20 = 100M**

1) Write the Voltage & Torque equations for the Kron's primitive machine in matrix form .What observations are mode from the impedance matrix & Torque equation of this machine? (20M)

2) Obtain Mathematical modelling in matrix form for a given separately excited D.C motor? Obtain the transfer function and also write the formulae for undamped natural angular frequency & Damping factor for this machine? (20M)

3) A 3-Ph Induction motor has the following per phase parameters referred to stator:

Stator resistance	--- 0.30ohm
Rotor resistance	--- 0.45ohm
Stator & Rotor leakage reactance	--- 2.1ohm each
Magnetising reactance	--- 30.00ohm

Find out the parameters of an equivalent 2-ph induction motor if its per phase turns are :

(a) Same as that of the 3-phase Induction motor. (8M)

(b) 3/2 times that of the 3-phase induction motor. (8M)

(c) Sqrt 3/2 times that of the 3-phase induction motor. (4M)

4) Obtain the expressions for a 3-ph Induction motor (Voltage and Current) in state variable form in

(a) Stator Reference Frame (16M)

(b) Synchronous Reference Frame and Rotor Reference Frame Model. (4M)

5) (a) Derive the equation for Synchronous machine inductances L_s ,L_{sr} and L_r . (10M)

(b) Obtain the voltage equations in the rotor's dqo reference frame of Synchronous machines. (10M)

6) (a) Explain the dynamic performance of the synchronous machine during the sudden change in input voltage? (10M)

(b) Evaluate the reactance offered by the Synchronous machine during the 3-phase fault conditions. (10M)

7) (a) Explain the equal area criteria for input torque change and 3-phase fault. (10M)

(b) Obtain the Park's Transformation matrix. (10M)

8) Write a short note on following**:**

(a) Cross-field theory of 1-ph Induction machine. (10M)

(b) Power Equivalence. (10M)

FLEXIBLE AC TRANSMISSION SYSTEMS
SYLLABUS

UNIT-I: FACTS Concept and General System Considerations

Introduction to Facts devices, Power Flow in AC system, Dynamic stability Considerations and the importance of the controllable parameters, Definitions on FACTS, Basic types of FACTS Controllers, Basic concept of voltage source converters, Single phase, three phase full wave bridge converters operation, Transformer connections for 12 pulse, 24 and 48 pulse operation.

UNIT-II: CONVERTERS

Three level voltage source converter, pulse width modulation converter, Design of PWM converter to reduce the harmonics, basic concept of current source Converters, Comparison of current source converters with voltage source converters.

UNIT-III: Static shunt Compensators

SVC and STATCOM Operation & characteristics and Control of TSC, TSR, STATCOM, Comparison between SVC and STATCOM – STATCOM for transient and dynamic stability enhancement.

UNIT-IV: Static Series Compensation

GCSC, TSSC, TCSC and SSSC Operation and Control External system Control for series Compensator SSR and its damping – Static Voltage and Phase angle Regulators - TCVR and TCPAR –Operation and Control.

UNIT-V: UPFC and IPFC

The unified power flow Controller – Operation –Comparison with other FACTS devices – control of P and Q – dynamic performance – special Purpose FACTS controllers – Interline Power flow Controller – Operation and Control.

Text Books:

1. N.G Hingorani & L.Gyugyi " Understanding FACTS: Concepts and Technology of Flexible AC Transmission System" , IEEE Press,2000
2. K.R.Padiyar "FACTS Controller in power Transmission and Distribution" New Age Int Publisher,2007

Reference Books:

1. Ned Mohan et.al "Power Electronics" John Wiley & Sons
2. T.J.E Miller, "Reactive power control in electric Systems" John Wiley & sons.

FLEXIBLE AC TRANSMISSION SYSTEMS
Model Question Paper

Time:3hrs **Max Marks:100**

Answer any five questions **5 X 20 = 100M**

1. What are the Problems Associated with the present day Power Systems and explain how FACTS Controllers can provide the solutions. (10M)

2. a. Write about power flow in a meshed system. (10M)
   b. Comparison between Voltage Sourced Converter & Current Sourced Converter. (10M)

3. a. Classify the FACTS controllers with neat sketch. (10M)
   b. Write about basic concept of Pulse Width Modulation Converter. (10M)

4. Explain basic concept of voltage sourced converter & current sourced converter. (20M)

5. Explain single-phase full wave bridge converter operation with waveforms and derive the square-wave voltage harmonics. (20M)

6. Discuss about transformer connections for 12-, 24-Pulse operation. (20M)

7. Explain the operation of Three-Level Voltage Sourced Converter with waveforms. (20M)

8. Discuss the power flow and dynamic stability aspects of simple transmission system, what are the benefits of FACTS Controllers. (20M)

POWER ELECTRONIC CONTROL OF DRIVES
SYLLABUS

Unit-I

Control of induction motor**,** Review of steady-state operation of Induction motor, Equivalent circuit analysis, torque-speed characteristics. Voltage Source Inverter Fed Induction motor drives &Current Source Inverter Fed Induction motor drives. Control of induction by Slip power recovery schemes.

Unit-II

Vector control of Induction Motor: Principles of vector control, Direct vector control, derivation of indirect vector control, implementation – block diagram; estimation of flux, flux weakening operation.

Unit-III

Control of Synchronous motor drives: Synchronous motor and its characteristics- Control strategies- Constant torque angle control- power factor control, constant flux control, flux weakening operation, Load commutated inverter fed synchronous motor drive, motoring and regeneration, phasor diagrams. PMSM and BLDC control of Drives, control of Variable Reluctance Motor Drive

Unit-IV

Speed control of dc Motors-Different types of speed control techniques by using single phase& three phase ac systems closed loop control of phase controlled DC motor Drives. Open loop Transfer function of DC Motor drive- Closed loop Transfer function of DC Motor drive –Phase-Locked loop control.

Unit- V

Closed loop control of chopper fed DC motor Drives, Speed controlled drive system – current control loop – pulse width modulated current controller – hysteresis current controller – modeling of current controller – design of current controller.

Text Books:

1. Modern Power Electronics and AC Drives –B. K. Bose-Pearson Publications-
2. Electric Motor Drives- R.Krishanan- Prentice Hall, Indian Edition.

REFERENCES:

1. Power Electronics and Motor Control – Shepherd, Hulley, Liang – II Edition, Cambridge University Press
2. Power Electronic Circuits, Devices and Applications – M. H. Rashid – PHI.
3. Fundamentals of Electrical Drives by GK Dubey, Narosa Publishers.

POWER ELECTRONIC CONTROL OF DRIVES
MODEL QUESTION PAPER

Time:3hrs **Max Marks:100**

Answer any five questions **{5 X 20 = 100M}**

1. **a.** Explain about open loop transfer function of dc motor drive (12M)
b. Explain briefly about phase locked loop control (8M)

2. Explain about the fallowing current controllers
a. PWM controller (12M)
b. Hysteresis controller (8M)

3. Explain the fallowing VFI control methods of induction motor drive
a. Open loop v/f control (10M)
b. Current controlled VFI (10M)

4. Discuss about fallowing slip power recovery schemes
a. Static Kramer drive (12M)
b. Static scherbius drive modes of operation (8M)

5. **a.** Explain principle of vector control of IM (8M)
b. Discuss about direct or feedback vector control (12M)

6. Explain about control strategies of synchronous motor
a. constant torque angle control (10M)
b. constant flux control (10M)

7. **a.** Explain load commutated inverter fed synchronous motor drive. (10M)
b. Explain about variable reluctance motor drive (10M)

8. **a.** List and compare various closed loop control techniques of chopper fed DC drives (10M)
b. Explain mathematical modeling of current control loop of chopper fed Dc drive. (10M)

POWER ELECTRONICS CIRCUITS – I

SYLLABUS

Unit I : POWER ELECTRONICS DEVICES:

power electronic devices – SCR, Theory of operation of SCR, Two transistor model of SCR, Characteristics and ratings, SCR turn on and turn off methods, Firing circuits, DIAC, TRIAC, IGBT, MOSFET and their characteristics , MTO,ETO , IGCTs , MOS-controlled thyristors(MCTs) – Static Induction Thyristors (SITHs) – Power integrated circuits (PICs) – symbol, structure and equivalent circuit – comparison of their features.

Unit II : NATURAL COMMUTATED CONVERTERS:

AC to DC Converter- single phase controlled rectifier bridge type - with R load- RL load- with and without FWD- analysis & wave forms- three phase controlled rectifier bridge type with R, RL loads with & without FEWD- analysis & waveforms – performance factors of natural commutated converters - advantages- applications - power factor improvements.

Unit III : AC VOLTAGE CONTROLLERS:

Single phase Ac voltage controllers- with R & RL loads- Analysis & waveforms- three phase AC voltage controllers- analysis& wave forms – AC synchronous tap changers - Matrix converters, cyclo converters

Unit IV : PWM INVERTERS (single phase)

Bridge type- Single phase Inverters. MC Murray- Bedford inverter- and their analysis & waveforms – Bridge type three phase Inverters with different modes. CSI-some applications- comparison of VSI & CSI. Simple problems. PWM and their methods, Advanced modulation techniques for improved performance, stepped, harmonic injection and delta modulation, Advantages, application

Unit V : D.C - D.C. Converters.

Analysis of step-down and step-up dc to dc converters with resistive and Resistive-inductive loads – Switched mode regulators – Analysis of Buck Regulators - Boost regulators – buck and boost regulators – Cuk regulators – Condition for continuous inductor current and capacitor voltage – comparison of regulators –Multiouput boost converters – advantages – applications – Numerical problems.

Text books:

1. Power Electronics – Mohammed H. Rashid – Pearson Education –Third Edition – First Indian reprint 2004.
2. . Power Electronics – Ned Mohan, Tore M. Undeland and William P. Robbins – John Wiley AND Sons – Second Edition

Reference Books:

1. Power Electronics by W.Launder
2. Industrial Electronics & Robotics by Shaler & C.Menamee

POWER ELECTRONICS CIRCUITS-I

Model question paper

Time: 3 hours Max Marks: 100

Answer any five questions **5 X 20 = 100M**

1. a) What is turn-on and turn-off characteristics and switching losses of MOSFET. Explain? 10M

   b) Describe the various methods of thyristor turn-on? 10M

2. a) Discuss the operation of three phase fully controlled rectifier supplying RL load with neat waveforms. Also derive the expression for the average output voltage? 12M

   b) A single phase bridge rectifier has a purely resistive load R=10Ω,the peak supply voltage Vm=170 v, and the supply frequency f=60HZ.Determine the average output voltage of rectifier if the source inductance is negligible? 8M

3. a) Explain the operation of three-phase cyclo converter with neat diagram? 10M

   b) Explain the operation of 1 φ AC voltage controller with RL loads? 10M

4. a) Explain the operation of matrix converter with necessary diagram? 8M

   b) Discuss the operation of single phase full controlled rectifier supplying RLE load with neat waveforms. Also derive the expression for the average output voltage? 12M

5. a) Explain the operation of 3 φ bridge inverter for 180 degree mode of operation with aid of relevant phase and line voltage waveforms? 12M

   b) The single phase full bridge inverter of resistive load R=2.4ohm and dc input voltage is 48v.Determine RMS output voltage at the fundamental frequency, output power, and the total harmonic distortion? 8M

6. a) What is PWM? Explain the various techniques involved in it? 10M

   b) Explain in detail about step up and step down choppers? 10M

7. a) With neat diagram explain the working of buck-boost switching mode regulator? 10M

   b) With neat diagram explain the working of cuk switching mode regulator? 10M

8. a)Explain the Operation of MC Murray- Bedford inverter. 10M

b)Explain the Comparision between VSI & CSI and its applications. 10M

MODERN CONTROL THEORY

SYLLABUS

UNIT–I: DIGITAL CONTROL SYSTMES

Introduction, Signal Reconstruction, Difference Equation, Z Transfor Function, Response of Linear Discrete Systems, Z Transform Analysis of Discrete data Control Systems, Z and S Domain Relation ship, Stability of Discrete systems.

UNIT- II: STATE VARIABLE ANALYSIS OF DIGITAL CONTROL SYSTEMS

Introduction, State Descriptions of Digital Processors, State Description of sampled continuous time plants, Solution of State difference equations, Controllability and Observability

UNIT-III : NONLINEAR SYSTEMS

Introduction – Non Linear Systems - Types of Non-Linearities – Saturation – Dead-Zone - Backlash – Jump Phenomenon etc;– Singular Points – Introduction to Linearization of nonlinear systems, Properties of Non-Linear systems – Describing function–describing function analysis of nonlinear systems – Stability analysis of Non-Linear systems through describing functions

.UNIT-IV: STABILITY ANALYSIS

Stability in the sense of Lyapunov, Lyapunov's stability and Lypanov's instability theorems - Stability Analysis of the Linear continuous time invariant systems by Lyapunov second method– Direct method of Lyapunov – Generation of Lyapunov functions – Variable gradient and Krasoviskii's methods – estimation of transients using Lyapunov functions.

UNIT- V : OPTIMAL CONTROL

Introduction to optimal control - Formulation of optimal control problems – calculus of variations – fundamental concepts, functionals, variation of functionals – fundamental theorem of Calculus of variations – boundary conditions – constrained minimization – formulation using Hamiltonian method – Linear Quadratic regulator

TEXT BOOKS:

1.M.Gopal – Digital Control and state variable methods, Tata Mcgraw'Hill, 2nd eddition
2.M.Gopal - Mpdern Control System Theory - New Age International (P.Ltd,) 2nd eddition,1984

REFERENCE BOOKS:

1. Stafani etal , "Design of Feedback control Systems" – Oxford Press, 4th eddition.
2. Ogata K, "Modern Control Engineering," Prentice Hall, 4th eddition.

MODERN CONTROL THEORY

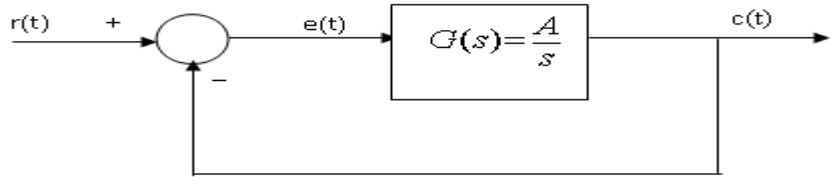
Model question paper

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

Answer any five questions of the following

1. a) Explain reconstruction of the signal using sampler and ZOH circuit. **10M**
   b) Obtain Z transforms of i) $e^{-at}\ sin\omega t\ and\ \ ii)\ cos\omega t$ **10M**

2. a) Find the difference equation of the control system shown in figure below **10M**



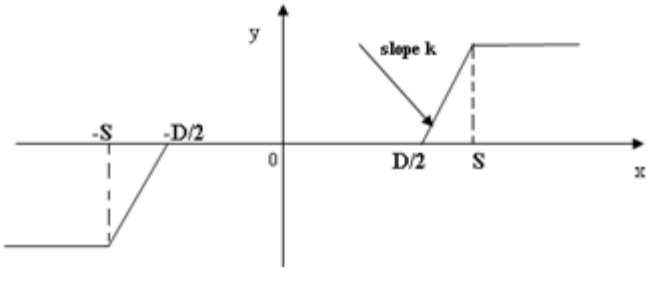
   b) Solve the difference equation

$$x(k+2)-x(k+1)+2x(k)=4^k\,;x(0)=0,x(1)=1$$

   using Z-inverse Transform **10M**

3. a) The dynamics of a linear time invariant system is given by
   x(k+1) = F x (k) + g u(k), x(0) = x^0 , y(k) = C x (k) + D u(k).
   Obtain the expression for the transfer function of the above system **10M**
   b) Find Φ(k) if the matrix $F=\begin{bmatrix}0 & 1\\ 0.16 & -1\end{bmatrix}$ **10M**

4. a) Explain different types of limit cycles of non linear systems **10M** b) Derive the Describing function for Dead zone and saturation nonlinearity shown in figure below.
   10M



5. a) State the stability theorem of a system given by

$$\dot{X}(t)=f(X(t),t);f(0)=0,\ X(0)=X^0$$

   using Second method of Liapunov **10M**
   b) Determine the stability of the linear system given by $\begin{bmatrix}\dot{X}_1\\ \dot{X}_2\end{bmatrix}=\begin{bmatrix}-1 & -2\\ 1 & -4\end{bmatrix}\begin{bmatrix}X_1\\ X_2\end{bmatrix}$ **10M**

6. a) State and prove Krasovskii method for the construction of Liapunov function of a nonlinear system. **10M**

b) Investigate the stability of the equilibrium point of the system

$\dot{X}_1(t) = X_2;\ \dot{X}_2(t) = X_1 - X_2 - X_2^3;$

using Krasovskii method **10M**

7. a) Find an admissible control u*(t) which causes the system

$\dot{X}(t) = f(X(t), u(t), t); X \epsilon R^n, u \epsilon R^p$

To follow an admissible trajectory X*(t) and minimizes the Performance measure

$$J = h\left(X(t_f), t_f\right) + \int_{t_0}^{t_f} g(X(t), u(t), t)dt$$

with both ends are fixed and the control is unbounded. **10M**

b) A control system is described by $\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 100 \end{bmatrix} u, X(0) = \begin{bmatrix} -1 \\ 0 \end{bmatrix}$

Find the feed back matrix K by minimizing the performance index

$J = \int_0^\infty (X_1^2 + 0.25\ u^2)$ dt **10M**

8. a) Explain the concept of Controllability and Observability in the Z-plane. **10M**

b) With neat sketch , explain (i) ON-OFF relay with dead zone (ii) Saturation **10M**

POWER SYSTEM ANALYSIS AND DYNAMICS

SYLLABUS

UNIT-I: POWER SYSTEM STABILITY

Basic definitions, statement of the problem, elementary model, Swing equations, power angle equations, Natural frequencies of oscillations, and single-machine-infinite bus system-Equal area criterion-classical model of a multi machines systems.

UNIT-II: RESPONSE TO SMALL DISTURBANCES

The unregulated synchronous machine, Modes of oscillations of an unregulated multi machine system, regenerated synchronous machine, Distribution of power impacts.

UNIT-III: SYNCHRONOUS MACHINE

Reactance and Time constants of a synchronous machine- Basic notions and relation to short circuit oscillogram. Circuit equations of Synchronous machine and parks Transformations, Vector diagrams in steady state and transient state, Power angle curves of a salient pole machine, a procedure for multi machines systems, effect of saturation, effect of damper windings as stability, damper action explained by theory of induction - motor.

UNIT-IV: EXCITATION SYSTEMS

Typical Excitations configurations and excitation, (Automatic) Voltage regulators, Exciter Build- up, excitation system response and computer representations of excitations systems (types 1, 2, 3 and 4).

UNIT-V: EFFECT OF EXCITATION ON STABILITY

Effect on (a) Power limits, (b) Transient stability, (c) Dynamic stability, approximate excitation system representation, supplementary stabilizing signals.

Text Books:

1. P.M.Anderson and A.A.Foud, “Power System Control and Stability”, The IOWA state university press: AMES, IOWA, USA-GALGOTIA Publications (Indian English Language Edn.1981).
2. Edward Wilson Kim bark, “Power System Stability: Synchronous Machines”, Volume 3 Dover publications Inc., New York(1961)

Reference Books:

1. M. Powella & P. G. Murthy, “Transient Stability of Power Systems - Theory & Practice”, John Wiley Publications.(1994).
2. Charles & Concordia, “Mathematical Modeling of Synchronous Machines” John Willy & Sons, New York, 1951.

POWER SYSTEM ANALYSIS AND DYNAMICS

Model Question Paper

Time: 3 hours Max Marks: 100

Answer any five questions **5 X 20 = 100M**

1. A Generator having H= 6.0 MJ/MVA is delivering power 1.0 P.U to an infinite to bus through a purely reactive network when the occurrence of a fault reduces the generator output power to zero. The maximum power that could be delivered is 2.5 P.U When the fault is cleared, the original network conditions again exist. Determine the critical clearing angle and critical clearing time.
(20M)

2. (a) A 50 Hz four pole turbo generator rated 500 MVA, 22 KV has an inertia constant of H=7.5 MJ /MVA. Find (a) the kinetic energy stored in the rotor at synchronous speed.
(6M)

(b) the angular acceleration if the electrical power developed is 400 MW when the input ---the rotation losses is 740000 h.p (c) if the acceleration is constant for a period of 15 cycles find the change in δ in electrical degrees in the period and the speed in r.p. m at the end of 15 cycles.
(6M+8M)

3. The data for the power system is given below in Fig 1.0

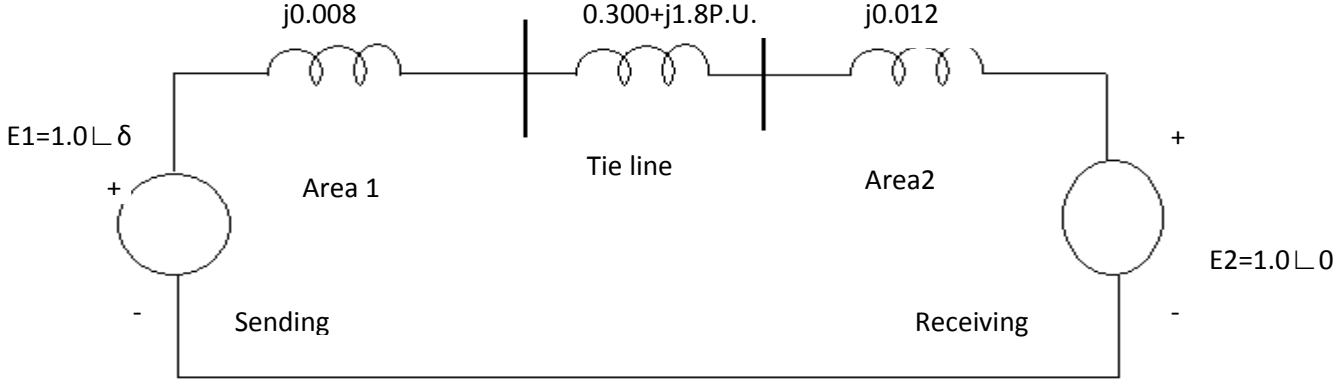


Fig. 1.0

The systems data are given in PU on a 1000MVA base the capacity of area 1 is 20000 MW and that of area 2 is 14000 MW the inertia constants of the machines with the two areas are about equal.

(a) Find the equations of power for P_1 and P_2 (6M)

(b) Find the operating conditions when P_1 =100 MW. This would correspond approximately to a 100M.W Tie line flow from area 1 to area 2. (8M)

(C) Find the synchronizing power coefficients. (6M)

4. A salient pole synchronous generator having the following per unit reactance's X_d=1.15 X^1_d=0.37; X_q 0.75; X^1_q= 0.75. Is delivering current of 1.0 PU at 0.91 P.F lagging through a circuit breaker to an infinite bus having a voltage of 1.0 P.U of the circuit breaker is then opened

(a) How long may it be kept before being reclosed without loss of synchronism? (10M)

(b) If this generator undergoes a three phase fault at its terminals which is cleared 0.2 sec later the exciter voltage is constant. Calculate E^1_q for rated load. (10M)

5. a. Write a short notes on 'park's transformation'. (8M)

b. A synchronous generator reactance 1.2 p.u is connected to an infinite busbar(V=1.0p.u] through transformers and a line of total reactance of 0.6p.u. The generator no load voltage is 1.2.p.u. and is inertia constant is H=4MJ/MVA. The resistance and machine damping may be assumed negligible. The system frequency is 50 HZ. Calculate the frequency of natural oscillations if the generator is loaded to (i) 50% and (ii) 80% of maximum power limit.
(12M)

6. The block diagram shown in Fig 2.0 represents the machine terminal voltage at no load.

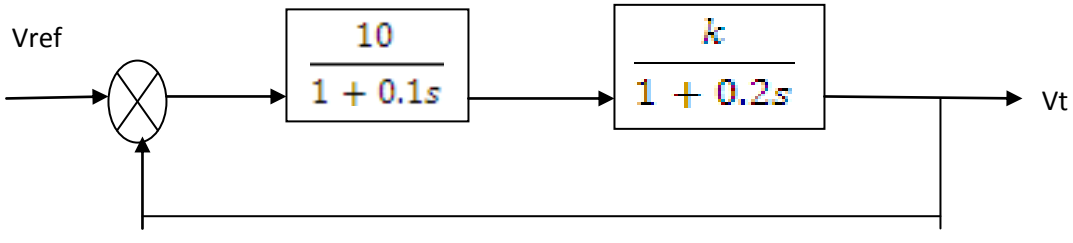


Fig. 2.0

(a) Find the response of the terminal voltage if V_{ref} = 1 P.U. if K=1 (10M)

(b) Find the highest value of K for which the system does not loose stability. (10M)

7. In Fig 1.0, $\delta_1=30^0$, H=2: Find the swing equation if the mechanical input P_m=1.0 per unit; and find its solution. Missing data (if any) can be suitably assumed. (20M)

8. a. Analyze the A.C exciter voltage, taking in to account the major time constants and neglecting other effects. (8M)

b. Describe the effect of excitation on following conditions.

i. Power limits under ideal conditions (6M)

ii. Dynamic stability (6M)

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POWER QUALITY

SYLLABUS

Unit I: Introduction

Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring

Unit II: Long Interruptions

Interruptions – Definition – Difference between failure, outage, Interruptions – causes of Long Interruptions – Origin of Interruptions – Limits for the Interruption frequency – Limits for the interruption duration – Short interruptions

Unit III: Short Interruptions

Definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

Unit IV: Voltage sag – characterization – Single phase

Voltage sag – definition, causes of voltage sag, voltage sag magnitude, monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, voltage sag duration - Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

Unit V: Mitigation of Interruptions and Voltage Sags

Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller.

Text books:

1. Math H J Bollen, "Understanding Power Quality Problems: voltage sags and interruptions", Wiley-IEEE Press, 1999.
2. Roger C Dugan, Surya Santoso, Mark F. McGranaghan, H. Wayne Beaty, "Electrical power systems quality", Second edition, 2002.

Reference Book:

1. *Angelo Baggini*, "Hand book of power quality", wiley publications, 2008.

POWER QUALITY

Model Question Paper

Time: 3 hours Max Marks: 100

Answer any five questions **5 X 20 = 100M**

1. a) Explain the different Issues of power quality. 12M

   b) Explain the responsibilities of the suppliers and users of electrical power. 8M

1. a) what is an interruption? Clearly differentiate 'Failure', 'Outage' and 'Interruption. 10M

   b) Explain about i) origin and causes of short interruptions ii) fuse saving. 10M

2. Briefly explain the changes in voltage and current during fault period and post fault Period in single phase tripping. 20M

3. A) Describe the procedure for estimating the voltage sag performance. 8M

   b) Explain briefly how sag duration is measured. 12M

4. a). Distinguish different mitigation methods from fault to trip. 10M

   b) Explain the role of combined series and shunt controller for voltage mitigation. 10M

5. a) Explain voltage sag calculation in non- radial system. 10M

   b). what is meant by impulsive transient and oscillatory transient? Explain the causes and effects. 10M

6. a) Explain the methods of monitoring short interruption. 8M

   b) Define the phase term 'phase single jump'. Derive an expression for magnitude and phase angle jump versus distance. 12M

7. a. Explain how equipment immunity can be improved 10M

   b. Describe the operation of a combined shunt and series controller 10M

8. a) Explain voltage source converter and series voltage controller 10M

b) Describe the remedies to improve power quality 10M

AI TECHNIQUES IN POWER SYSTEMS (ELECTIVE)

Syllabus

UNIT-I ARTIFICIAL NEURAL NETWORK:

Fundamentals of artificial neural networks – Basic concepts of neural networks - Biological Prototype - Artificial neuron – Basic models of artificial neural networks - connections– learning - Activation functions - Important terminologies of ANN - Neural Network Architecture - Single layer artificial neuron networks - Multilayer artificial neuron networks – Recurrent networks.

UNIT-II SUPERVISED LEARNING NETWORK:

Perceptron Network – Perceptron learning rule - Architecture- Perceptron training algorithms – Adaline – Architecture –Madaline - Architecture – Training Algorithms - Architecture of Back Propagation Network- Back Propagation Learning– Input layer computation– Hidden layer computation – Output layer computation– Back Propagation Algorithms.

UNIT-III FUZZY LOGIC

Introduction – Fuzzy sets- basic Fuzzy set operations – Properties of Fuzzy sets - Membership function- features of membership function - Fuzzy Inference Systems - Methods of FIS – defuzzification methods – centroid method – weighted average method

UNIT-IVGENETIC ALGORITHMS:

Introduction- Characteristics of Genetic algorithms- Basic operators and Terminologies in Gas - search space – Effects of Genetic operators - Traditional Algorithm Vs Genetic Algorithm -Simple GA - General Genetic Algorithm

UNIT-V APPLICATION TO ELECTRICAL SYSTEMS:

ANN based Short Term Load Forecasting - load flow studies - Fuzzy Logic based Unit Commitment and Genetic Algorithm based Economic Dispatch

TEXT BOOKS:

1. S.N.Sivanandam & S.N.Deepa, "Principles of Soft Computing", Wiley India (P) Ltd., 1st Indian Edition 2008
2. J.S.R. Jang, C.T. Sun, E. Mizutani "Neuro Fuzzy and Soft Computing", Pearson education.

REFERENCE BOOKS:

1. D.E Goldberg," Genetic Algorithms", Addison – Wisley 1999
2. Bast kosko, "Neural networks &Fuzzy systems", Prentice Hall.

AI TECHNIQUES IN POWER SYSTEMS

Model Question Paper

Time: 3 hours Max Marks: 100

Answer any five questions **5 X 20 = 100M**

1. Explain how neural networks helps in problem solving techniques 20M
2. Explain the basic mathematical model of an artificial neural network. 20M
3. Describe the activations functions & Explain the terminologies of ANN 20M
4. Draw & explain the architecture of Adaline& medaline in detail. 20M
5. Explain the basic models of genetic algorithms 20M
6. Discuss some of the properties of fuzzy logic 20M
7. Explain how a neural network helps in load forecasting & describe load flow problem. 20M
8. a). Use genetic algorithm technique in solving economic dispatch. 10M

   b) Draw & explain the architecture of back propagation algorithm 10M

K L University
Department of ENGLISH
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

English Language Teaching

Acquisition of Soft Skills and Career growth

1. Soft Skills Vs Hard Skills
2. Coaching and mentoring
3. Soft empowerment
4. Personal growth

Effortless ways of soft skills enhancement

1. Self-assessment
2. Measures to improve Soft skills
3. Constant practice
4. Communicate with others

Why soft skills

1. Platform To Showcase Your Technical Skills
2. Stay In The Fast Lane
3. Bring Out The Leadership Qualities
4. Personal Growth

Soft skills Training in Engineering Colleges

1. Soft Skills training conducted by Lectures
2. Soft Skills training conducted by Retied Faculty
3. Soft Skills training conducted by inhouse training Team
4. Soft Skills training conducted by Freelance trainers
5. Soft Skills training conducted by Training companies

Develop Soft Skills Competency

1. Training planning
2. Systematic and advance levels of training
3. No individual passion for learning
4. Poor family back ground

Systematic Soft skills training methods .

1. Training Vs Teaching?
2. Components of Training?
3. Steps in Training Delivery
4. Effective Feedback matrix

1. Nature & Scope of Linguistics
2. Branches of Linguistics

a) Applied linguistics

*Morphology

*Phonology

*Syntax

*Semantics

*Pragmatics

*Discourse analysis

b) Socio linguistics

3. Fundamentals of Language Teaching – Aims, Objectives, Methods, Materials.

4. History of English Language Teaching.

Major Approaches and Methods of Language Teaching

* The Grammar Translation Method

* The Direct Method

* The Audio Lingual Method

* Communicative Language Teaching

* Behaviourist Theory

*Structural Approach

* Functional Approach

* Natural Approach

5. Structure of Modern English

6. Methods of Testing and Assessment.

* Objectives of test types: aptitude, placement, diagnostic, achievement and proficiency.

7. Use of Technology for Language Teaching.

Books prescribed.

1. John Lyons. New Horizons in Linguistics
2. Jack Richards &Theodore Rodgers. 2001. Approaches and Methods in Language Teaching
3. M.L.Tickoo. 2003. Teaching and Learning English .Orient Longman
4. Gavin Dudeney. 2007. The Internet in the Language Classroom: A Practical Guide for Teachers.
5. Context in Language Learning and Understanding. Editors: Kirsten Malankjaee and John Williams.
6. English Language Teaching Materials: Edited by nigel Harwood and Jack Richards.
7. From corpus to class Room. Edited by: Anne O, Michael Mccarthy and Ronald Carter.
8. From Teacher to Manager. Edited by: Ron White, Andy Hockey, Melissa.

S. Laughner and Julie Van der Horst Jansen

9. Teacher Trainer Essentials Edited by: Craig Thaine.
10. History of English Language Teaching by Dimitrios Tanasoulas
11. Approaches and Methods in Language Teaching. By Jack c. Richards and Theodore. S. Rodgers.
12. An Introduction to Sociolinguistics by Ronald Wardhaugh
13. Companion to Sociolinguistics by Carman Llamas, Peter Stockwell, Louise Mullany

English Language Teaching

PART-A

1.Answer the following all questions. Each carrying 4 marks 10x4=40 Marks

1. What problems do students have while learning English ?

2. Write about course evaluation ?

3.Write two reasons for taking notes ?

4.Write easy steps for reading comprehension ?

5. How do you write the summary of the given text ?

6. What is Grammar ? List all the meanings that come to your mind

7. What are the principles of teaching Grammar ?

8. What is meaning focussed Teaching ?

9. What technique do you commonly use in your class while teaching difficult vocabulary ?

10. Do you think the use of the mother tongue for providing 'meaning equivalents" of certain words is legitimate ?

PART-B

11. Answer any FOUR questions. Each carries 5 marks 4x5=20 Marks

1. What are the implications of conditioned learning ?

2. Give a brief description on the principles of learning according to the cognivists?

3. Explain the theories of language learning in relation to practice ?

4 .How could you react to or interpret errors made by children in their first language? Give examples

5. What is Ethnography? How can it be applied in language learning?

PART-C

111. Answer any FOUR questions and all questions carry equal marks 4x10=40 Marks

1. What is the influence of Linguistics and Psychology on ELT ?

2. List the updated developments of ELT?

3. How has structuralism in ELT developed in India ?

4. What are the consequences of maintenance of a dominant language on indigenous minorities? What are the implications of curriculum?

5. Indicate how language teaching is considered by different schools of psychology ?

PART-A

1. Answer the following all questions. Each carrying 4 marks 10x4=40 Marks

1. Write about soft skills ?

2. What is the need of learning soft skills in the present scenario ?

3. What is the difference in naming the hard skills ?

4. How do you ddifferentiate soft skills and hard skills ?

5.Explain role of soft skills in personal growth

6. Explain the techniques for self assessment

7. Write some measures to improve soft skills ?

8. Why does ‘constant practice’ a buzz word in learning ?

9. Write some tips to communicate with others with much ease.

10. Explain ‘stay in the fast line’

PART-B

11. Answer any FOUR questions. Each carries 5 marks 4x5=20 Marks

1. How do you bring out leadership qualities in students ?
2. Write about systematic level of training?
3. Write about advanced level of training?
4 . How does inhouse training team develop soft skills competency ?
5. Write the objectives of freelance trainers training programmes?

PART-C

111. Answer any FOUR questions and all questions carry equal marks 4x10=40 Marks

1. How do you develop soft skills competency in students ?
2. What are your plans in implementing soft skills training programmes in Engineering colleges
3. Write about importance of soft skills in the corporate companies ?
4. What are the ways for effortless ways of soft skills enhancement ?
5. Write about acquisition of soft skills and career growth?

FOURTH WORLD LITERATURE

Syllabus

- Background on the term Fourth World
- Fourth World Countries
- Minority writings in India
- Economics and Politics in the fourth world
- Cultures of the Fourth World
- Sources and Resources of the Fourth World
- Marginalization and Victimization in the Fourth World
- Indigenous people of the Fourth World
- Intramural and Extramural conflicts of the Fourth World
- Contemporary voices of the Fourth World, Progress and Development of the Fourth World.
- Post-Colonial Criticism
- Culture Studies
- Fourth World Terminology- State, Nation etc

FOURTH WORLD LITERATURE

MODEL QUESTION PAPER

Time: 3 hrs **MARKS: 100**

Answer any Four Questions (from 1-5)

Each Question Carries 20 Marks

6th Question is compulsory

1) **Present an insight into the common experiences of the Native people of the Fourth World?**
2) **Give the significance of the periodic rise of Fourth World Theory?**
3) **Discuss some contemporary works brought out by the writers of the fourth world?**
4) **Discuss the school of thought- Post-colonial criticism in the light of Fourth World Literature?**
5) **The stature of Fourth World Nations in the Era of Globalization-elucidate?**
6) **Write short notes**
    a) **World Literature**
    b) **Third World**
    c) **Indigenous People**
    d) **Fourth World Countries**

THEMES AND IDENTITY IN GLORIA NAYLOR'S WORKS

Syllabus

- African American Literature
- American Novel
- 20th century American Novelists
- African American- Novelists and their themes
- African American women writers
- Naylor's Biography
- Naylor's works (Selected- The Women of Brewster Place, Linden Hills, Mama Day, Bailey's Café, The Men of Brewster Place)
- Magical Realism

THEMES AND IDENTITY IN GLORIA NAYLOR'S WORKS

MODEL QUESTION PAPER

Time: 3 hrs **MARKS: 100**

Answer any Four Questions (from 1-5)

Each Question Carries 20 Marks

6th Question is compulsory

1. **Discuss the most popular themes in Naylor's works?**
2. **Justify the significance attached to the strong and admirable characterization of African American female characters woven by Gloria Naylor?**
3. **Analyze the phase of 'Transformation' of characters taking any one of the works of Gloria Naylor for support?**
4. **Naylor calls herself a wordsmith, a true storyteller-is her claim justified?**
5. **How does Naylor play with the term 'Identity' both literally and figuratively?**
6. **Write short notes:**

- **Gist of 'Mama Day'**
- **A brief on the theory 'Magical Realism'**
- **Approach to 'Healing' in Naylor's novels**

INDIAN WRITING IN ENGLISH

Syllabus

1. Origin and Growth of Indian Writing in English
2. Trends and Movements in Indian Writing in English
3. Pre-Independent Writers and their writings
4. Post Independent writers and their writings
5. Modern Techniques in Indian Writing in English
6. Contemporary poetry and fiction and impact of globalization
7. Patriotism and National outlook in Indian writing
8. Feminist and revolutionary writings in India

Books recommended:

1. Iyengar, Srinivas : Indian Writing in English.
2. Kirpal, Viney, The New Indian Novel in English.
3. Mukherjee, Meenakshi. Twice Born Fiction. NewDelhi. 1974.
4. Mukherjee, Meenakshi, Realism and Reality,NewDelhi, O.U.P., 1985.
5. Naik, M. K. Perspectives on Indian Prose in English,New Delhi, , 1971.
6. Sharma, K. K. (ed.), Indo-English Literature,Ghaziabad, Vimal Prakashan, 1977.
7. Ramamurti, K. S., Rise of the Indian Novel in English, Sterling Publishers, 1987.
8. Verghese, Paul, Problems of the Indian CreativeWriter in English,1971.
9. Ahmed, Aijaz, In Theory,New Delhi, O.U.P. 1992.
10. Brennan, Timothy, Salman Rushdie and The ThirdWorld,New York, , 1989.
11. King, Bruce, Modern Indian Poetry in English,NewDelhi. OUP, 1987.
12. Chavan, Sunanda. The Fair Voice, New Delhi, SterlingPublishers, 1984

Indian Writing in English

Time: 3 hrs **MARKS: 100**

Answer any Four Questions (from 1-5)

Each Question Carries 20 Marks

6th Question is compulsory

1. Discuss the influence of Indian Freedom Struggle in Indian Writing in English?
2. How Indian Philosophy of life is redefined in Pre Independent Indian English Poetry
3. Liberation and revolt as the themes of Drama. Discuss with reference to post Independent theatre.
4. How the Devotion and Love reflected in Tagore's "Gitanjali".
5. Discuss about the Dalit, Minarity and Feminist writings of 21st century Indian Writing in English.
6. Answer the following in 250 words:
    a. Arundati Roy as champion Tribal Problems
    b. Character of Jaya in shashidesh Pandes's That Long Silence
    c. Narrate the Technique in "Hayavadana"
    d. Theme in Mulk Raj Anand's "The Serpent and the Rope"

REPRESENTATION OF HISTORY IN THE SELECT NOVELS OF SALMON RUSHDIE

Time: 3 hrs **MARKS: 100**

Answer any Four Questions (from 1-5)

Each Question Carries 20 Marks

6th Question is compulsory

1. Write the Major Themes in the works of Salmon Rushdie?
2. Repetition of History in the novels of Rushdie?
3. Discuss the Plights of the people described in Midnight's Children
4. Write about The Satanic Verses and the Fatwa
5. Discuss the Religious and poltical beliefs reflected in the writings of Rushdie
6. Answer the following:
    a. Fantacy and Science in Grimus
    b. Magic Realism in *Shame*
    c. Autobiographical element in Joseph Anton: a Memoir
    d. Write in brief any one Short story from East,West.

Dialectics of History that interface in Fiction – Amitav Ghosh

Time: 3 hrs **MARKS: 100**

Answer any Four Questions (from 1-5)

Each Question Carries 20 Marks

6th Question is compulsory

K L University
Department of MATHEMATICS
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

SPECIAL FUNCTIONS

SYLLABUS

UNIT-I: The Gamma and Beta Functions

The Gamma function ,A series for $\Gamma'(z)/\Gamma(z)$,Evaluation of $\Gamma'(1)$, the Euler product for $\Gamma(z)$,the difference equation $\Gamma(z+1)=z\Gamma(z)$,evaluation of certain infinite products , Euler 's integral for $\Gamma(z)$, the Beta function , the value of $\Gamma(z)\,\Gamma(1-z)$, the factorial function , Legendre 's duplication formula , Gauss multiplication theorem , a summation formula due to Euler .

UNIT-II: BESSEL FUNCTIONS

Definition of J_n (x) , Bessel's differential equation , Differential recurrence relation, A pure recurrence relation, A generating function, Bessel's integral, Index half an odd integral, modified Bessel function, orthogonality property for J_n (x).

UNIT-III: LEGENDRE'S POLYNOMIALS

Definition of P_n (x) , Differential recurrence relations, the pure recurrence relation, Legendre's differential equation, the Rodrigue's formula , orthogonality property , special properties of P_n (x), more generating functions, Laplace's first Integral form , Expansion of x^n

UNIT-IV: HERMITE POLYNOMIALS

Definition of H_n (x),Recurrence relations , the Rodrigue's formula ,other generating functions ,integrals, the Hermite polynomials as ${}_2F_0$, orthogonality , expansion of polynomial s, more generating functions.

UNIT-V: LAGUERRE POLYNOMIALS

The Laguerre polynomial definition , generating functions, , recurrence relations, the Rodrigue's formula, the differential equation , orthogonality, expansion of polynomials , special properties ,other generating functions , the simple Laguerre polynomials.

TEXT BOOK:

(1) Special functions by E.D. Rainville, MacMillan company, New York, 1960.

SPECIAL FUNCTIONS

MODEL PAPER

Time:3 hours **Max Marks:100**

Note: Answer <u>ANY FIVE</u> from the following.

1 (a) Find the relation between the beta and the gamma function.

(b) Evaluate $\int_0^{\pi/2} \sqrt{tan\,\theta}\, d\theta$.

2 (a) State and prove the Legendre's duplication formula.

(b) Evaluate $\int_0^{\infty} e^{-ax} x^{m-1} sin\, bx\, dx$ **, by using gamma function.**

3 (a) Prove the orthogonality property for the Bessel function.

(b) Show that $J_n'(x) = \frac{1}{2}[J_{n-1}(x) - J_{n+1}(x)]$.

4 (a) State and prove the Rodrigue's formula for Legendre polynomials.

(b) Express the polynomial $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ **in terms of Legendre polynomials.**

5 (a) State and prove the generating function for Hermite polynomials.

(b) Prove that $2xH_n(x) = 2nH_{n-1}(x) + H_{n+1}(x)$.

6 (a) Show that $\int_0^{\infty} e^{-x} L_m(x) L_n(x) dx = 0,\ m \neq n$.

(b) Evaluate $\int_0^{\infty} e^{-2x} [L_3(2x)]^2 dx$.

7 (a) Using Rodrigue's formula, show that $P_n(x)$ **satisfies the differential equation**

$$\frac{d}{dx}\left[(1+x)^2 \frac{d}{dx}[P_n(x)]\right] + n(n+1)P_n(x) = 0.$$

(b) Prove that $\int_0^{\infty} e^{-ax} J_0(bx) dx = \frac{1}{\sqrt{a^2+b^2}}$.

8 (a) Evaluate $\int_{-\infty}^{\infty} e^{-x^2} [H_2(x)]^2 dx$.

(b) Prove that $\square_{\square}'(\square) = \square_{\square-\square}'(\square) - \square_{\square-\square}(\square)$.

HYPERGEOMETRIC FUNCTIONS AND LIE –GROUPS

SYLLABUS

UNIT-I: THE HYPERGEOMETRIC FUNCTION

The function F (a, b; c; z), A simple integral form, F(a,b;c;1) as a function of the parameters, Evaluation of F(a,b;c;1), The hypergeometric differential equation, F(a, b; c; z) as of its parameters, Elementary series manipulations, Simple transformations, Relation between functions of z and 1-z, A quadratic transformation, Additional properties.

UNIT-II: GENERALIZED HYPERGEOMETRIC FUNCTIONS

The function pFq ,The exponential and binomial functions, A differential equation , other solutions of the Differential equation , A Simple integral , The pFq with unit argument, Saalschutz's Theorem, Whippele's Theorem, Dixon's Theorem, A useful integral.

UNIT-III: THE CONFLUENT HYPERGEOMETRIC FUNCTION

Basic properties of the ${}_1F_1$, Kummer's first and second formula, A theorem due to Kummer.

Generating functions : The generating function concept, generating functions of the form $G(2xt - t^2)$, sets generated by $e^t \Phi(xt)$, the generating functions $A(t)\exp(-xt/1-t)$.

UNIT-IV: LIE ALGEBRAIC TECHNIQUE

Lie groups, Lie algebras and one parameter subgroups, homomorphism, linear differential operators, Preliminary observations, The Laguerre function, $L_n^{(\alpha)}(x)$, the hypergeometric function ${}_2f_1(-n, \alpha; \beta; x)$, the modified Laguarre function $L_n^{(\alpha-n)}(x)$.

UNIT-V: THE WEISNER METHOD

Introduction, The differential equation, linear differential operators, group of operators, the extended form of the group generated by B and C, Generating functions for modified Laguerre polynomials, Simple Bessel functions, Gegenbauer polynomials

TEXT BOOK:

(1) Special functions by E.D. Rainville, MacMillan Company, New York, 1960.
(2) A treatise on generating functions by H.M.Srivastva and H.L.Manocha, Halsted/Wiley New York, 1984.
(3) Obtaining Generating functions by Mc.Bride, springer verlag, New York, 1971.

HYPERGEOMETRIC FUNCTIONS AND LIE - GROUPS

MODEL PAPER

Time: 3 hour **Max Marks:100**

Note: Answer <u>ANY FIVE</u> from the following.

1. **Derive the differential equation for the hypergeometric function ${}_2F_1$ (a , b ; c ; z) and express the exponential and the binomial function in terms of hypergeometric function.**
2. **State and prove the Dixon's theorem.**
3. **Define the confluent hypergeometric function and derive the Kummer's first and second formula.**
4. **Explain Lie algebraic (Special linear group SL(2, C)) technique to obtain the generating function.**
5. **Define a generating function and explain various types of generating functions.**
6. **Prove that $(1-t)^{-1-\alpha} exp\left(\frac{-xt}{1-t}\right) = \sum_{n=0}^{\infty} L_n^{(\alpha)}(x)t^n$.**
7. **Derive the recurrence relations of ascending and descending type for ${}_2F_1$ (-n ,a ;b ; x).**
8. **Write in brief the Weisener's method of deriving generating functions.**

NUMERICAL METHODS

SYLLABUS

UNIT-I

Numerical Differentiation and Integration

Introduction, Numerical Differentiation, Numerical Integration, Euler-Maclaurin Formula, Adaptive Quadrature Methods, Gaussian Integration, Singular Integrals, Fourier Integrals, Numerical Double Integration

UNIT-II

Numerical Solution of Ordinary Differential Equations

Introduction, Solution by Taylor's Picard's Method, Euler's Method, Runge-Kutta Methods, Predictor-Corrector Methods, the Cubic Spline Method, Simultaneous and Higher Order Equations, Boundary Value Problems: Finite-Difference Method, The Shooting Method,

UNIT-III

Numerical Solution of Partial Differential Equations

Introduction, Finite-Difference Approximations, Laplace's Equation: Jacobi's Method, Gauss-Seidel Method, SOR Method, ADI Method, Parabolic Equations, Iterative Methods, Hyperbolic Equations.

UNIT-IV

System of Linear Algebraic Equations

Introduction, Solution of Centro-symmetric Equations, Direct Methods, LU- Decomposition Methods, Iterative Methods, III-conditioned Linear Systems.

UNIT-V

The Finite Element Method: Functionals- Base Function Methods of Approximation- The Rayleigh – Ritz Method –The Galerkin Method, Application to two dimensional problems- Finite element Method for one and two dimensional problems.

Reference Books:

1. Niyogi, Pradip, "Numerical Analysis and Algorithms", Tata McGraw –Hill
2. Balagurusamy,E., "Numerical Methods", Tata McGraw –Hill
3. Sastry, S.S., "Introduction Methods of Numerical Analysis", PHI
4. Chapra, S.C. and Canale, R.P., "Numerical Methods for Engineers", Tata McGraw –Hill

NUMERICAL METHODS

MODEL PAPER
TIME: 3Hrs

Marks: 100

Answer any five from the following **5X20=100**

1. (a) Using R-K method of forth order, find $y(0.1)$ and $y(0.2)$ for the equation $\frac{dy}{dx}=\frac{y-x}{y+x}, y(0)=1,$ take $h=0.2.$

   (b) Solve the equation $y''=x+y$ with the boundary conditions $y(0)=y(1)=0.$

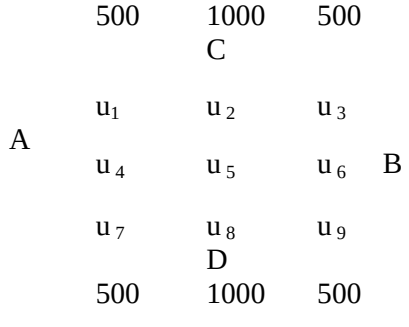
2. (a) The deflection of a beam is governed by the equation $\frac{d^4y}{dy^4}+81y=f(x)$, where $f(x)$ is given by the table

x	1/3	2/3	1
$f(x)$	81	162	243

   and boundary condition c. Evaluate the deflection at the pivotal of the beam using three sub-intervals.

   (b) Using Picard's method find an approximate values of y and z corresponding to $x=0.1,$ given that $y(0)=2, z(0)=1$ and $\frac{dy}{dx}=x+z, \frac{dz}{dx}=x-y^2.$

3. (a) Solve the Laplace equation for the square mesh of the following figure with boundary values as shown.



   (b) Find the solution of the initial boundary value problem $\frac{\partial^2u}{\partial t^2}=\frac{\partial^2u}{\partial x^2}, 0\le x\le 1;$ subject to the initial conditions $u(x,0)=\sin\pi x, 0\le x\le 1;$ and the boundary conditions $u(0,t)=u(1,t)=0, t>0$, by using in the (i) the explicit scheme and (ii) the implicit scheme.

4. (a) Use adaptive quadrature to evaluate the integral $\int_{0.1}^{2}\sin\frac{1}{x}dx$ to within an accuracy $\varepsilon=0.001$

   (b) Use 3-point Gauss – Legendre formula to evaluate the integral $\int_0^{\pi/2}\sin x\,dx$.

5. (a) Use Rayleigh – Ritz method to solve the BVP $\frac{d^2y}{dx^2}+2x=0,\ y(0)=y(1)=0$

(b) Using Galerkin method, solve Poisson's equation $\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}=\mathrm{k},\ 0<x,\ y<1$

with $u=0$ on the boundary C of the region R.

6. (a) Using shooting technique, solve the BVP

$y''(x)-y(x)=0;\ y(0)-0,\ y(1)=1.1752,$ we choose $m_0=0.7, m_1=0.8.$

(b) Given the BVP $x^2y''+xy'-y=0,\ y(1)=1, y(2)=0.5$ apply the cubic spline method to determine the value of $y(1.5)$

7. Decompose the matrix

$A=\begin{bmatrix}5 & -2 & 1\\ 7 & 1 & -5\\ 3 & 7 & 4\end{bmatrix}$ into the form LU and hence solve the system AX=B where B=[4 8 10]^{T} . Also Determine L^{-1} and U^{-1} and hence find A^{-1}

8. (a) Solve the heat conduction equation $\frac{\partial u}{\partial t}=k\frac{\partial^2 u}{\partial y^2},$ subject to the boundary conditions $u(0,t)=u(1,t)=0$ and $u(x,0)=x-x^2,$ take $h=0.25$ and $k=0.025.$

(b) Determine the solution of the following system of linear equations

$$20x + y - 2z = 17$$
$$3x + 20y - z = -18$$
$$2x - 3y + 20z = 25$$

using Jacobi method.

FLUID DYNAMICS

SYLLABUS

Unit I

Kinematics of Fluids in motion: Real fluids and Ideal fluids- Velocity of a fluid at a point, Stream lines , path lines , steady and unsteady flows- Velocity potential - The vorticity vector- Local and particle rates of changes - Equations of continuity - Worked examples - Acceleration of a fluid – Conditions at a rigid boundary.

Unit II

Equations of motion of a fluid: Pressure at a point in a fluid at rest - Pressure at a point in a moving fluid - Conditions at a boundary of two inviscid immiscible fluids- Euler's equation of motion - Discussion of the case of steady motion under conservative body forces.

Unit III

Some three dimensional flows: Introduction- Sources, ranks and doublets - Images in a rigid infinite plane - Axis symmetric flows – Stokes stream function.

Unite IV

Some two dimensional flows: Meaning of two dimensional flow - Use of Cylindrical polar coordinate - The stream function - The complex potential for two dimensional , irrotational in compressible flow - Complex velocity potentials for standard two dimensional flows - Some worked examples – Two dimensional Image systems - The Milne Thompson circle Theorem.

Unit V

Viscous flows: Stress components in a real fluid. - Relations between Cartesian components of stress- Translational motion of fluid element - The rate of strain quadric and principle stresses - Some further properties of the rate of strain quadric - Stress analysis in fluid motion - Relation between stress and rate of strain- The coefficient of viscosity and Laminar flow - The Navier – Stokes equations of motion of a Viscous fluid.

Contents : F. Chorlton, Text Book of Fluid Dynamics ,CBS Publications. Delhi,1985.
Unit 1: Chapter 2. Sec 2.1 to 2.10.
Unit 2: Chapter 3. Sec 3.1 to 3.7.
Unit 3: Chapter 4. Sec 4.1 to 4.5.
Unit 4: Chapter 5. Sec 5.1 to 5.8.
Unit 5: Chapter 8 Sec 8.1, t0 8.9.

REFERENCE(S)

[1] G.K. Batchelor, An Introduction to Fluid Mechanics, Foundation Books, New Delhi, 1984.

[2] A.J. Chorin and A. Marsden, A Mathematical Introduction to Fluid Dynamics, Springer-Verlag, New York, 1993.

[3] S.W. Yuan, Foundations of Fluid Mechanics, Prentice Hall of India Pvt Limited, New Delhi, 1976.

[4] R.K. Rathy, An Introduction to Fluid Dynamics, Oxford and IBH Publishing Company, New Delhi, 1976.

FLUID DYNAMICS MODEL PAPER

TIME: 3Hrs **Marks: 100**

Answer any five from the following **5X20=100**

1. (a) Explain the Eulerian and Lagrangian method of describing fluid motion.
   (b) Define stream lines, path lines and streak lines. Determine the equation of stream lines, if $\bar{q} = xI - yJ$.
2. (a) Derive the relation between Stress and Rate of strain for an incompressible fluid.
   (b) For a fluid moving in a fine tube of variable section A, Prove that the first principles the equation of continuity is $A\frac{\partial \rho}{\partial t} + \frac{\partial}{\partial s}(A\rho v) = 0$
   where v is the speed at a point P of the fluid and s the length of the tube up to P. what does this become for steady incompressible flow?
3. (a) Prove that the equation of motion of a homogeneous inviscid liquid moving under forces arising from potential V is
   $\frac{\partial q}{\partial t} - q \wedge \zeta = -\text{grad}\left(\frac{p}{\rho} + \frac{1}{2}q^2 + \nabla\right)$ where $\zeta = \text{curl}\, q$ is the vorticity.
   (b) A two dimensional incompressible steady flow field with velocity components in the rectangular coordinates given by
   $u(x,y) = \frac{k(x^2 - y^2)}{(x^3 + y^3)}$, $v(x,y) = \frac{2xy}{(x^3 + y^3)}$ where k is an arbitrary constant non-zero constant. Verify whether the continuity is satisfied?
4. (a) Derive the equation of the continuity in the vector form.
   (b) If $\int A.ds = 0$ for all closed curves in a region R show that there exists a scalar function V such that $A = -\text{grad}V$.
5. (a) Define the vorticity ω in the motion of a continuous medium with velocity $v(x,y,z,t)$. Show that for a motion an inviscid incompressible fluid of uniform density, under gravity, the vorticity satisfies the equation $\frac{\partial \omega}{\partial t} + (v.\nabla)\omega = (\omega.\nabla)v$ and explain the significance of each term in this equation.
6. (a) Derive Navier-Stokes equation for the flow of an incompressibe fluid in vector form.
   (b) Consider an incompressible steady flow with constant velocity. The velocity components are given by

$$u(y) = y\frac{U}{h} + \frac{h^2}{2\mu}\left(-\frac{dp}{dx}\right)\frac{y}{h}\left(1 - \frac{y}{h}\right)$$
$$v = w = 0$$

   If the body force is neglected, does $u(y)$ satisfy the equation of motion? h, U and $\frac{dp}{dx}$ are constants, and $p = p(x)$.
7. (a) Define Stress at a point. Verify the equality of the shearing stresses $\sigma_{yz} = \sigma_{zy}$.
   (b) Let the new coordinate system (x', y') be obtained from the original coordinate system (x, y) by a rotation through an angle 45^0. Verify the invariants of the rates strain for a rectilinear flow with a linear velocity profile, i.e., u=ay, v=0.
8. (a) Derive the boundary layer equations in two dimensional flow.
   (b) Derive Blasius Solution of an incompressible fluid past a thin flat plate.

K L University
Department of MECHANICAL ENGG.
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

ADVANCED HEAT AND MASS TRANSFER
L-T-P
3-1-0

Introduction - review of heat transfer Fundamentals - transient conduction and extended surface Heat Transfer, Unsteady heat conduction. Lumped capacity model, awareness of one-dimensional unsteady results (charts; Biot and Fourier numbers), Brief review of Steady Laminar and Turbulent Heat Transfer in External and Internal Flows - Heat Transfer at High Speeds - Unsteady Laminar and Turbulent Forced Convection in Ducts and on Plates - Convection with body forces, Boundary layers and internal flows. Awareness of these configurations, some knowledge of internal flow energy balances, Convection correlations. Finding heat transfer coefficients from Reynolds numbers and Rayleigh numbers, Heat Exchangers. Typical configurations and epsilon-NTU analysis, phase-change heat transfer. General awareness of processes of condensation and boiling in a pure substance, some use of correlations, Quenching of metals, Leidenfrost problem, heat transfer of sprays, jets and films, Radiation basics - Radiation in Enclosures - Gas Radiation - Diffusion and Convective Mass Transfer - Combined Heat and Mass Transfer from Plates and in Pipes.

TEXT BOOKS:

1. Heat Transfer – A practical approach, Y. A. Cengel, Tata McGraw-Hill (2002)
2. Advanced Heat and Mass Transfer, A. Faghri, Y. Zhang, J. Howell, Global Digital Press (2010)

REFERENCE BOOKS:

1. A Heat Transfer Text Book, J. H. Lienhard iv, and J. H. Lienhard V, Phlogiston Press (2008)
2. Heat and Mass Transfer, H. D. Baehr, and K. Stephan, Springer-Verlag (1998)
3. Heat transfer, F. M. White, Addision-Wesley (1984)
4. Basic heat and mass transfer, K. C. Rolle, Prentice-Hall (2000)
5. Heat transfer, A. Bejan, John Wiley & Sons (1993)

ADVANCED HEAT AND MASS TRANSFER

Time: 3 Hours Max. Marks: 60

Answer question No.1 and any five from remaining

1. Answer the following: 10x1=10 M
   a. Define mass average velocity.
   b. Give expression for relative boundary layer thickness of velocity and concentration boundary layers?
   c. Explain the significance of Heisler charts.
   d. Differentiate between fin efficiency and fin effectiveness.
   e. What is the importance of Grashoff number in convection
   f. What is importance NTU?
   g. What is meant by thermal entrance length?
   h. Write a short note on gas radiation.
   i. Show regimes of pool boiling on boiling curve.
   j. What are differences between film and dropwise condensation?
2. (a) Derive the expression for the temperature distribution of lumped system. 4 M
   (b) Steam in a heating system flows through tubes whose outer diameter is D_1= 3 cm and whose walls are maintained at a temperature of 125^{o}C. Circular aluminium fins (k = 180 W/m^{o}C) of outer diameter D_2= 6 cm and constant thickness t = 2mm are attached to the tube. The space between the fins is 3 mm, and thus there are 200 fins per meter length of the tube. Heat is transferred to the surrounding air at = 27^{o}C, with a combined heat transfer coefficient of h = 60 W/m^2 ^{o}C. Determine the increase in heat transfer from the tube per meter of its length as a result of adding fins. 6 M
3. (a)Define Prandtl number. Show that for laminar flow over flat plate the average convective heat transfer coefficient is twice the local heat transfer coefficient. 5 M
   (b) Water flows at the rate of 0.1 kg/s through a thin metallic tube of 1 cm diameter and 3 m in length. It enters the tube at 25° C. The outer surface of the tube is maintained at a constant temperature of 100° C. Calculate the exit temperature of water. 5 M
4. Consider a 0.6 m X 0.6 m thin square plate in a room at 30°C. One side of the plate is maintained at a temperature of 90°C, while the other side is insulated; determine the rate of heat transfer from the plate by natural convection if the plate is a) vertical, b) horizontal with hot surface facing up, and c) horizontal surface facing down. 10 M
5. Consider a cylindrical furnace with radius = Height = 1 m. The top surface (surface 1) and the base surface (surface 2) of the furnace has emissivities 0.8 and 0.4 respectively, and are maintained at uniform temperatures T_1 = 700 K and T_2= 500 K. The side surface closely approximates a blackbody and is maintained at a temperature of T3 = 400K. Determine the net rate of radiation heat transfer at each surface during steady operation and explain how these surfaces can be maintained at specified temperatures. 10 M
6. Cold water at 0.5 kg/sec enters a parallel flow heat exchanger at 25° C to cool 0.25 kg/sec of hot water entering at 70° C. Overall heat transfer coefficient is 500 W/m^2 K, specific heat of cold and hot water is 4180 L/kg K. (i) Calculate the area required for this heat exchanger. (ii) If the fluids are made to flow in counter flow configuration, what will be their exit temperatures,(Note NTU remains same for the both heat exchangers) 10 M
7. Consider a circular pipe of inner diameter 0.015 m whose inner surface is covered with a layer of liquid water as a result of condensation. In order to dry the pipe, air at 300 K and 1 atm is forced to flow through it with an average velocity of 1.2 m/s. using the analogy between heat and mass transfer, determine the mass transfer coefficient inside the pipe for fully developed flow? 10 M
8. Saturated steam at atmospheric pressure condenses on a 2 m high and 3 m wide vertical plate that is maintained at 80^{0}C by circulating cooling water through the other side. Determine (a) the rate of heat transfer by condensation to the plate (b) the rate at which the condensate drips off the plate at the bottom. 10 M

FINITE ELMENT METHODS

Model Question Paper

Max Marks: 100 **Time: 3 Hrs**

Answer any five Questions from the following **(5 x 20 = 100 M)**

1. a) Explain in brief about **[3M]**

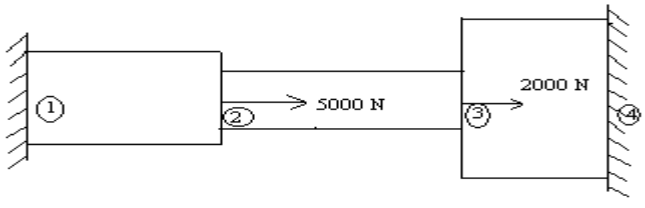
i) Rayleigh – Ritz method and **ii)** Galerkin method

b) The displacement field is specified as $u = k (x^2-xy+y^2)$, $v= k(-x^2+xy-y^2)$, E = 200 Gpa, $\mu=0.28$, $k=10^{-4}$ cm. Determine 3 planar strains at x=1cm, y=1cm. **[5M]**

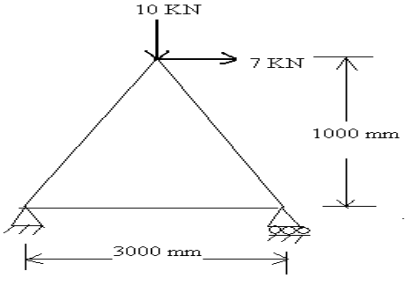
c) Determine the maximum deflection at the mid point for a simply supported beam loaded with UDL, using Rayleigh Ritz Method **[12M]**

2. a) Derive Stiffness matrix or 1-D Bar Element. **[5M]**

b) For the following stepped bar, determine the displacements at nodes 2 and 3, stresses in 3 sections and reactions at the ends, Use both elimination approach and penality approach to adopt Boundary conditions and compare the results obtained using both the methods. Take L_1= 1000mm, A_1 = 500 mm^2, E_1 = 2 x 10^5 N/mm^2, L_2= 1500mm, A_2 =300 mm^2, L_3= 250mm, A_3 = 625 mm^2, E_3 = E_2 = E_1. **[15M]**

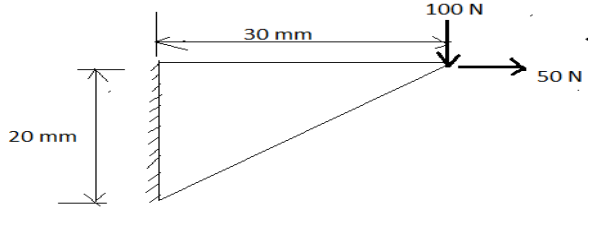


3. a) Analyze the following three member truss and determine nodal deflections and stresses in members, take Area of each member is 600 mm^2 and E = 200 Gpa. **[15M]**



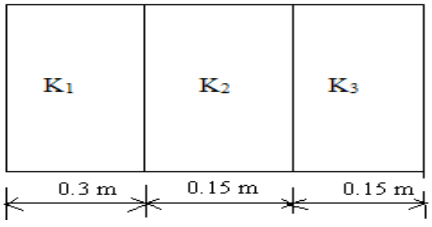
b) For a element$_{1-2}$, if q_1= 0.03mm, q_2= -0.005mm, ξ_p= -0.05. Find the shape functions N_1 and N_2. **[5M]**

4. a) For the plate shown below, find displacement at point of load and stress in the element. Take thickness of plate as 10 mm, E = 2 x 10^5 N/mm^2, μ = 0.3**.** **[15M]**



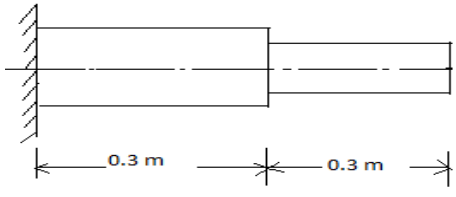
b) What is a constant strain triangular element? State its properties and applications? **[5M]**

5. a) A Composite wall consists of 3 materials as shown below, the outer temperature is 20^0c, convective heat transfer takes place on the inner surface of the wall with 800^0c and h = 25 w/m^2 ^{0}c. Determine the temperature distribution in the wall. K_1= 20 w/m^0c, K_2= 30 w/m^0c, K_3= 15 w/m^0c. **[12M]**



b) Derive one dimensional steady state heat conduction equation and apply two one dimensional fin **[8M]**

6. Determine Eigen values and Eigen Vectors for the bar element shown below, take ρ = 7800kg/m^3 ,E = 200 Gpa , A_1=600 mm^2, A_2= 300 mm^2 and draw the mode shapes. **[20M]**

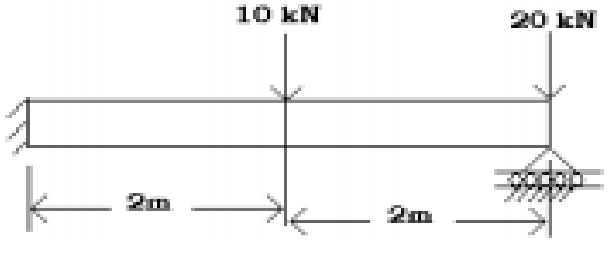


7. a) What is the need of finite element analysis for solving the engineering problems? Explain its significance in solving different solid mechanics problems. **[10M]**

b) The nodal coordinates and its functional value of a triangular linear element are given below. Calculate the value at (20, 6) and also calculate B matrix. **[10M]**

Node	**Co-ordinates**	**Value**
Node1	(12,1)	180
Node2	(25,6)	160
Node3	(12,12)	185

8. a) A beam of 4 m length is subjected to point loads at the distances of 2 m and 4 m from the fixed end of 10 kN and 20 kN respectively. Calculate the deflection at the center of the beam, if E = 2 x 10^{11} N/m^2,and A = 400 mm^2. **[12M]**



b) Derive the Strain displacement matrix for a Tetrahedron Element. **[8M]**

DESIGN OF THERMAL SYSTEMS

Time: 3 Hours Max. Marks:60

Answer question No.1 and any five from remaining

1. Answer the following: 5x2 M
   (a) Discuss two types of predictive models used in simulation of thermal systems.
   (b) Differentiate between workable and optimum design solution.
   (c) Explain the use of information diagram in the analysis of thermal systems
   (d) How depreciation effect the profit of a company?
   (e) Why Linear and Dynamic Programming methods of optimization are not generally used in thermal systems?
2. (a) Explain steps involved in the development of numerical models of thermal systems 5M

   (b) For vapor compression refrigeration system used for cooling a cold storage, consider and briefly discuss the various approximations and idealizations that can be made to simplify the mathematical model. When are these approximations valid and how would you relax them? 5M
3. (a) Discuss Steady and transient process used in analysis of thermal systems. 3M
   (b). In a manufacturing industry, the cooling rate of certain component is critical. Experiments were carried to get the cooling rate curve. The following table gives the measured values of temperature as a function of time.

t(sec)	0.2	1.0	2.0	5
T ^{o} C	146.0	114.8	85.1	34.6

   An exponential decrease in temperature is expected from lumped mass modeling. Obtain a best fit to represent these data 7M.
4. (a). M/s Mahindra Tractors Ltd. at Hyderabad has decided to procure steering gear component from OEM supplier at large quantities regularly. Three suppliers responded to the specifications and submitted their offer with different terms and conditions. Supplier A as quoted the lowest price per piece at R. 2700/- payable against the supply. Supplier B quoted Rs.3000/- with payment terms consists two installments, Rs.1500/- at the end of first year and Rs 1500/- at the second year. The third supplier C has given an option to pay Rs. 3200/- at the end of second year. Suggest selecting the supplier if the prevailing interest rate is 8%. Review the case if the interest rate is 10%. 5M
   (b) To boost the sales of high tech product, a company has offered Rs. 5,00,000/ - as loan to the customer from its subsidiary finance unit. It offers loan at 10% nominal annual interest compounded monthly. The monthly repayment is fixed as Rs.15,000/-. Calculate how many months it will take to repay the loans 5M
5. A total length of 100 m of tubes must be installed in a shell and tube heat exchanger, in order to provide the necessary heat transfer area. The total cost of the installation includes (i) the cost of tubes, which is constant at Rs.50000/-. (ii) the cost of the shell equal to $55000D^{2.5}L$. (iii) the cost of the floor space occupied by the heat exchanger equal to 15000DL, where L the length of the heat exchanger and D is the diameter of the shell, both in meters. The spacing of the tubes is such that 200 tubes fit in a cross-sectional area of 1 m^2 in the shell. Determine the diameter and length of heat exchanger for minimum cost. 10M
6. Explain briefly linear and dynamic programming methods of optimization. 10M
7. In a manufacturing system, rectangular boxes of length X, height Y and width Z (in m) and open at the top are used for storing and conveying of material. The cost of material and fabrication is Rs.150 per unit surface area in square meters. The cost of storage is inversely proportional to the volume, being Rs.1000 for unit volume in m^3. Formulate the optimization problem for minimizing the total cost of using these boxes and obtain the optimum cost by using geometric programming. 10M
8. Explain the following optimization methods. 10M
   (a) Fibonacci Search method (b) Penalty function method

PRECISION ENGINEERING

Model Question Paper

Max Marks: 100 **Time: 3 Hrs**

Answer any five Questions from the following **(5 x 20 = 100 M)**

1. a) Discuss the influence of displacement accuracy on machined work pieces in basic machine tools? [**10M]**

b) Describe the two major specifications for evaluating the positioning accuracy of Numerical Control machine tools? [**10M]**

2. a) Differentiate between Hole basis system and Shaft basis system. [**8M]**

b) A 50 mm diameter shaft is made to rotate in the bush. The tolerances for both shaft and bush are 0.050 mm. Determine the dimension of the shaft and bush to give a maximum clearance of 0.075 mm with the hole basis system. [**6M]**

c) What is a fit? Explain the classification of Fits with suitable examples? [**6M]**

3. a) What are various methods of specifying fits on splined shafts and holes? [**8M]**

b) Explain the unilateral and bilateral system of writing tolerances with suitable examples? [**6M]**

c) Explain the role of Gauges in inspection of distance between axes? [**6M]**

4. a) Discuss the various machining parameters that influences the surface roughness? [**10M]**

b) Discuss the various micro-finishing processes in the machining of metals? [**10M]**

5. a) Explain any two methods to improve accuracy and surface finish? [**10M]**

b) Differentiate between Precision Cylindrical Grinding and Internal Cylindrical Grinding [**10M]**

6. a) What a datum and a datum feature are and why they are chosen? [**6M]**

b) How to convert rectangular tolerance zones into cylindrical tolerance zones? [**8M]**

c) How to differentiate between features of similar size and configuration? [**6M]**

7. a) Define lithography? Write a short note on photolithography? [**10M]**

b) List out various applications of nanotechnology? **[10M]**

8. a) Explain Diamond Turning in machining of precision elements? **[10M]**

b) Write a short note on mirror grinding process? **[10M]**

K L University
Department of MANAGEMENT
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

MARKETING MANAGEMENT

Pre Ph D Syllabus

Unit I: Introduction to marketing, Core concepts of Marketing; Marketing Vs Selling; Marketing Orientations; Marketing Environment; Buyer Behavior; Marketing Planning Process; Consumer value and satisfaction; Identification and Analysis of Competitors.

Unit II: Market Segmentation and pricing, Targeting and Positioning strategies; Marketing Mix; The product, New Product Development, Product Life Cycle, Product Mix decisions, Branding, Packaging and Labeling. Factors influencing Price – five "C"s, Pricing Strategies; New product pricing.

Unit III: Marketing Research: Need for market research ,types of marketing research ,stages of marketing research, Marketing environment , customer value proposition, Non segmented markets, purpose of segmentation and market entry, target market selection , stages of target marketing analysis business markets, analyzing consumer markets.

Unit IV: Distribution Decisions; Channel alternatives; Choice of Channel; Channel Management, Channel Dynamics, Managing promotion Mix; Advertising, Personal selling, Sales Promotion and publicity, Integrated Marketing Communication.

Unit V: Marketing Control techniques; Marketing Audit; Social Marketing; Green Marketing; Web Marketing, New product options and development.

Learning Support:

Recommended Text Book(s):

1. Philip Kotler & Gary Armstrong, Prafulla Y Agnihotri – Principle of Marketing- South Asian Perspective 13/e, Pearson, New Delhi.

Reference Books:

1. V.S. Ramaswamy and S. Namakumari - Marketing Management Global perspective- Indian Context, 4th Edition, Mac Millan, New Delhi

2. Etzel, walker, Stanton and Pandit, Marketing: Concepts and Cases, TMH – New Delhi

3.K.Karunakaran: Marketing Management ,Text and cases,Himalaya,2009

3. Case Studies in Marketing - Indian context - R. Srinivas

4. Case study solutions - H. Kaushal

MARKETING MANAGEMENT

Model Question Paper
Time: 3 Hours Max. Marks: 100
Answer any FIVE of the following questions: 5x 20= 100

1. (a) Distinguish between Market Segmentation and Product Differentiation.

(b) Describe the bases that you will use in segmenting the market for the following products

(i) Hair dryer (ii) Low calorie sweetener

2. What are the objectives of Sales Promotion? As a Sales Manager, you have been assigned the task of planning the Sales Promotion program of a ready-to-consume meal. Discuss the steps that you would follow for effective planning and management of the said program.

3. Read carefully the following situations given below and answer the questions mentioned at the end of each case. ABC is a well-known brand in the cement industry. It has a large distribution network of around 8000 plus stockists and 20 C and F agents. During the last decade the company's market share has gradually declined to 15% from earlier 30%. About a couple of years ago, the brand opened its first company-owned retail outlet called "ABC Ki Duniya" (World of ABC). The outlet reassures the customer about the genuine material, and encourages interaction besides displaying a range of refractory and aluminium based products. This type of outlet is also likely to enhance the company's image.

Question : Taking into consideration the cement market and the commoditized nature of the product, comment on the pros and cons of an outlet of this kind. Would such outlets alone enhance sales? Discuss.

4. What are the promotional strategies that you would use during the Growth and Maturity stages of the following products:

(i) Men’s fairness cream (ii) Laptops

5. What are the major considerations involved in designing the marketing organisation? Discuss by taking any example of your choice.

6. Explain the various marketing environment constraints referred to by marketers, for the following sectors giving reasons: (i) Light Commercial Vehicles (LCV) e.g., Cars (ii) Hotels

7. How does the Product Life Cycle (PLC) influence the marketing mix decisions ?

Explain with suitable examples. Present product life cycle to cigarette business.

8. Louis & Gomitz Mejia et. al: Managing Human Resources, Pearson Education, 2007.

HUMAN RESOURCE DEVELOPMENT

Unit I: Foundations of Human Resource Development: Evolution of HRD, relationship between HRM and HRD/Training. HRD structure and functions, Role and competencies of HRD professionals, Challenges to HRD professionals, a frame work for the HRD process, Assessing HRD Needs. Globalisation challenge to HRD and Technology challenge to HRD.

Unit II: Designing Training: Needs assessment, learning theories and program design, individual differences in the learning process, learning strategies and styles, Training Evaluation, Training and development methods.

Unit-III: Organization development : Organisation development Theories and concepts, designing an Intervention strategy, types of interventions, Emerging concepts Kaizen, Benchmarking, quality Consciousness, Learning Organisation, HRD diversity: organisational culture, cross cultural education and training programs, HRD programs for culturally diverse employees.

Unit IV: Strategies for Advancing HRD: Schools of Strategic Thinking, The strategic Roles of HRD, Adopting a Strategic HRD Perspective, Scenario Building plus Strategic planing.Accountability in HRD: The program Evaluation Approach to accountability, the matrices Approach to accountability.

Unit V: Career management and development: Introduction, defining career concepts, stages of life and career development, models of career development, the process of career management, roles in career management, career development practices and activities, issues in career development.

Recommended Text Book(s):

1. Noe, A Raymond, Employee Training and Development, (2010), Irwin Mc Graw-Hill, U.S.A.
2. Foundations of Human Resource Development By Richard A. Swanson, Elwood F. Holton, Ed Holton, Berrett-koehler Publishers (2001).
3. Werner and Desimone, Human Resource Development, Cengage learning, 2006

Reference Books:

1. PC Tripathi, Human Resource Development,Sulthan chand &sons
2. TV Rao, HRD Audit, Sage Publications, New Delhi, 2000.
3. Udai Pareek and TV Rao, Designing and Managing Human Resource Systems, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, 2003
4. Dharni Singh et al. (eds.), Aligning Human Resources Processes: Challenges of Development, Tata McGraw-Hill Publishing Company limited, New Delhi, 1996.

FINANCIAL SERVICES AND MARKETS

Syllabus

Unit – I: Financial Services:

Financial system and markets – Nature and scope of financial services – Financial intermediation – Regulatory framework for financial services.

Unit - II: Asset Financing Services:

Leasing and hire-purchase – Debt securitization – Housing finance – Inter-corporate loans.

Unit – III: Merchant Banking Services:

Issue market and other services – Corporate advisory services – Market making process – SEBI guidelines on merchant banking.

Unit – IV: Financial Market Operations:

Money market – types- Securities market - Stock exchange operations – Stock broking services – Role of portfolio managers and registrars - Mutual funds – Regulations of SEBI on mutual fund operations.

Unit – V: Allied Financial Services:

Venture capital – Insurance services – Factoring – Forfaiting -.Discounting – Depository system – Custodian and custodial services – Credit rating - Credit cards.

Text Book:

1. Clifford Gomez, "Financial Markets, Institutions and Financial Services", PHI, Eastern Economy Edition, 2011
2. M Y Khan, "Financial Services", TMH,2008

Reference Books:

1. Ravi M. Kishore, "Financial Management", Taxmann's, Sixth edition, 2005
2. L M Bhole, "Financial Institutions & Markets – Structure, Growth & Innovations", TMH 4e, 2010
3. Anthony Saunders & Marcia Millon Cornett, " Financial Markets & Institutions", TMH, 2010

Journals:

1. International Journal of Financial Services Management
2. Journal of Financial Services Research

RURAL MARKETING

UNIT-1:

Rural Marketing-Definition-Evolution-Characteristics of Indian Rural Market-Rural Marketing vs Urban Marketing-Differentiating urban and rural markets-Opportunities and Challenges in Indian Rural Markets.

UNIT-II:

Segmentation variables-Approaches for segmenting Indian Rural Markets-Consumer behavior in rural markets-Differentiating consumer behavior in rural and urban markets-Rural market research-Opportunities, challenges in rural marketing research.

UNIT-III:

Rural Marketing Mix-Additional Ps of Rural Marketing-4As of Rural Marketing Mix-New Product Development for Rural Market-Rural Market Product Life Cycle-Pricing Strategies and Promotion.

UNIT-IV:

Brand loyalty in Rural Markets-Channel Management-Indian Rural Retailing and Logistics Management.

UNIT-V:

Marketing Strategies for Rural Marketing in FMCGs, Durables, Financial Services, Agricultural sectors-e-rural marketing-Rural Market Mapping-Organised Rural Marketing-IT for Rural Development.

REFERENCE BOOKS:

- C.S.G Krishnamacharyulu, Lalitha Ramakrishnan: Rural Marketing: Text and Cases, Pearson Education.
- Kaushik Sircar: Rural Marketing, Himalaya
- U.C. Mathur: Rural Marketing, Excel
- R.V. Badi and N.V.Badi: Rural Marketing, Himalaya.

RURAL MANAGEMENT

Model Question Paper

Time Duration: 3 hrs **Max. Marks: 100**

Answer any Five of the Questions:

1. What is Rural Marketing? How can you differentiate Rural Marketing with Urban Marketing?
2. What are the segmentation variables in rural marketing? What are the approaches for segmenting Indian Rural Market?
3. What are the elements of Rural Marketing Mix? What are the additional Ps in rural marketing mix?
4. How can you manage the channels of distribution in Rural marketing? Discuss.
5. Briefly discuss the marketing strategies for Rural marketing in FMCGs and Agricultural sectors.
6. 'IT plays a major role in Rural Development' Critically evaluate the statement in the light of the current scenario.
7. What are the pricing strategies suitably recommended for Rural Markets?
8. What is the role of Promotion in Rural Marketing?

RETAIL MANAGEMENT

Pre Ph D Syllabus

Unit-I: Retailing – Meaning, Nature- Factors Influencing Retailing- Functions of Retailing- Types of Retailing-Retail Formats- Multichannel Retailing-Issues & Challenges; Emergence of Organized Retailing in India. International Retailing- reasons for internationalization-assessment of market environment and Market entry methods.

Unit-II: Setting up Retail organization - Store location strategy, factors affecting the Retail location-Research and Techniques. Retail supply chain management- Sourcing and vender selection- Uncertainty and Inventory Management; Innovations in Supply chain management.

Unit-III: Retail consumer behaviour and factors influencing buying behaviour – Segmentation - Targeting- Positioning. Store Layout and Space planning- Types of Layouts- Visual Merchandising-Techniques; Store Facade-Store environment- Exteriors, Interiors -Store ambience-Store Atmospherics-Impulse Purchase.

Unit-III: Retail Pricing-Pricing Objectives -Pricing Methods-Price Adjustments-Pricing Techniques for Increasing Sales- Sales promotion technique; Human Resource Management in Retailing - Human Resource Planning - Recruitment - Selection - Training -Motivation and Appraisal-Compensation and rewarding store employees- Legal and Regulatory issues.

Unit-V: Customer service-Importance- customer complaints- CRM in retailing – process – planning and implementing loyalty programs- Impact of Technology on Retailing; E-tailing-Issues and Challenges-Social Marketing in Retailing.

References:

1. Barry Berman Joel & R Evans, Retailing Management-A Strategic Approach, Pearson Education, 2009.
2. Michael Levy, Burton A Weitz, Ajay Pundit- Retailing Mnagement,6/e, The Mc Graw -Hill Companies, 2008.
3. Nicholas Alexander Anne Marie Doherty- International Retailing-Oxford University Press.
4. RamKishen Y- International Retail Marketing Strategies- Jaico Publishing House-2009
5. Swapna Pradhan, Retailing Management Texts & Cases, 3/e-McGraw Hill, 2009.
6. A. J. Lamba, The art of Retailing, TMH, 2009.
7. Andrew J Newman & Petes Cullen, Cengage Learning, 2009.
8. Sinha, P.K and Uniyal D.P, Managing Retail, 2/e, Oxford University Press, 2007
9. Chetan Bajaj, Rajnish Tuli, Srivastava, N.V, Retail Management, Oxford University Press, 2005
10. Narayan Rangaraj, G Raghuram and Srinivasan, Supply Chain Management for Competitive Advantage Concepts and cases, TMH, 2009.
11. Rajesh Ray-Retail Logistics and Supply Chain Management, - The McGraw Hill Companies.

K L University
Department of PHYSICS
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

NANO SCIENCE AND TECHNOLOGY

Unit I

Introduction: Importance of Nano science &technology, Emergence of Nano-technology, Types of Nano materials, Bottom-up and Top-down approaches,, Applications of Nano Technology in Science and technology.

Unit II

Zero Dimensional Nano-structures: Nano particles through homogenous nucleation;

Growth of nuclei, synthesis of metallic nano particles, Nano particles through heterogeneous nucleation; Fundamentals of heterogeneous nucleation and synthesis of

nano particles using micro emulsions and Aerosol.

Unit III

One Dimensional Nano-structure, Nano wires and nano rods: Spontaneous growth: Evaporation and condensation growth, Casting method, vapor-liquid-solid growth, Electrochemical deposition and Electro spinning.

Unit IV

Two dimensional nano-structures: Fundamentals of film growth. Physical vapour

Depostion(PVD): Chemical Vapour Depostion (CVD) Characterization of nano materials

by using spectroscopic and microscopic techniques-XRD,FTIR,DSC,SEM and TEM.

Electrical measurements of nano composite materials by using fourprobe method.

Unit V

Introduction to Carbon Nano Tubes(CNTs), Properties, Preparation of CNTs-Laser

ablation method, Arc method, chemical vapor deposition (CVD), Sol-Gel method, Carbon

nanotube Polymer Nano composites ,Applications of Nano in drug delivery system.

Text books:

1.Introduction to Nano technologyby Charles P.Poole.Jr.& Frank J.ownes John

wielly&sons Inc. Publishers -2006

2. Nano structures and Nano materials: Synthesis, properties and applications Guozhong

Cao- Imperial College press.

Reference Book:" Nano structured Materials" by Jackie Ying academic press, 2001

NANO SCIENCE AND TECHNOLOGY

Time:3hrs Max Marks:100

Answer any FIVE of the following Questions. Each Question carries Equal Marks.

1. a) What are nano materials? Explain different types of nano materials?

b)Discuss the size effects on nano materials.

2. (a) List out few methods of Synthesis of nano particles.

(b) Explain how can you prepare the silver metal nano particles by using Physical Vapour Synthesis method with neat sketch?

3. (a) Mention different methods used to produce carbon nano tubes.

(b) Mention the properties and applications of carbon nano tubes

4. What is meant by SEM? Explain the construction and working of SEM? Give its applications?

5. Explain how you can Fabricate Nickel metal nano particles by using Chemical Vapour Deposition (CVD) method with neat sketch?

6. Briefly explain about Bottom-up and Top-down approaches. Explain the synthesis of nano particles using aerosol method.

7. How can characterize a nano composite material by using XRD ,DSC and SEM

8. Briefly explain the following

i) Nano wires and nano rods

ii) Physical vapour Deposition (PVD)

iii) Distinguish between SEM and TEM

iv) Applications of carbon Nanotubes in engineering

SOLID STATE IONICS

UNIT 1:- Introduction

Classification of solids – crystalline, amorphous materials and its processing techniques, structural characterization by IR, XRD, DSC/TGA and SEM methods

UNIT 2:- Ionic Materials

Introduction to polymeric materials – Blends, Composites and polymer electrolytes, Solid conducting polymer electrolytes – Fast ion conductors, Characterization. Solid conducting polymer electrolytes composites – Synthesis, processing and characterization and their device applications – Electrochemical cells, Rechargeable polymer battery, electro chromic devices, electro chemical solar cells, sensors.

UNIT 3:- Nano materials

Introduction to nano particles and nano composites, synthesis and processing technologies for

nanostructure materials – Chemical co-precipitation method, soldzer method, hydrothermal method, copolymerization method – Chemical oxidative polymerization method, structural, mechanical, optical and electrical studies of nano composites conductivity and electrical transport properties of processable nano

materials – Applications.

UNIT 4:- Electrochemical cell Devices

Introduction to Electro chemical cells, sensors and fuel cells – Types– Synthesis and development of solid electrolyte membranes – Characterization by XRD, Differential scanning calorimetry (DSC), SEM(Scanning Electron Microscopy)

UNIT-V: Measurements:

Measurement of electrical conductivity of solid electrolyte membranes – Determination of transference number by Wagner's polarization method, water balance in membranes – Fabrication and working principles of Electro chemical cell, fuel cell, sensors– Calculation of open circuit voltage (OCV), short circuit current, resistivity, current density, power density and estimation of efficiency, V-I characteristics of fuel cells, Application of fuel cells in transportation and low temperature electronic devices .

Prescribed Books: 1.Solid state Ionics for Batteries By M. Tatsumisago,M. Wakihara etc.,

Springer Publishers

2. Solid state Ionics by B.V.R. Chowdary,Wenji.B .World Scientifics Ltd.

SOLID STATE IONICS

Time: 3hrs Max Marks:100

Answer any FIVE of the following Questions. Each Question carries Equal Marks

1. (a) Explain briefly the different types of Solid Polymer Electrolytes.

(b) Describe the working mechanism of a Polymer battery?.How can you estimate the efficiency of an Electrochemical cell?

2. (a) What is meant by Carbon Nano Tube? Give different Synthesizing Methods.

(b) How can you synthesize a Carbon Nano Tubes by using RF Plasma method.

3. (a) Define Transition Temperature and Melting Temperature of Polymeric Material.

(b) Explain the Mechanical Properties of Polymers by stiffness, strength and toughness with neat diagrams.

4. (a Discuss the Transport properties of Solid Electrolyte Membranes.

(b) How can you determine the Transferce Number of a given Solid Electrolyte Membrane by using Wagner's Polarization method.

5. (a). What is meant by a Solid Polymer Nano composite? Mention its Characteristics.

(b) Discuss the Complexzation in Polymer Composites .How can you Study or Analyse the Complexation Mechanism by using different IR,XRD, Spectroscopic Techniques.

6. (a).Define a Fuel Cell. Discuss different types of Fuel Cells.

(b) What is PEM Fuel Cell? Explain the working of PEM Fuel Cell with neat Diagram.What is the role of Electrolyte in PEM Fuel Cell?

7. a) Explain transport phenomenon in polymer electrolytes?

b)Determine transference number by using Wagner polarization method

c)Explain V-I characterstics of fuel cells

8. Write a brief note on the Following.

(i) Structural Characterisation of a material by XRD

(ii) Electrochemical Solar Cells.

(iii) Synthesis Methods for Nanostructured Materials.

(iv) Fabrication of a PEM Fuel cell

SPECTROSCOPIC STUDIES ON TRANSITION METAL IONS

1. INTRODUCTION:

The concept of ligand field - The scope of ligand field theory – The'd' and other orbital's.The physical properties affected by ligand fields.

2. QUANTITAVIVE BASIS OF CRYSTAL FIELDS:

Crystal field theory – The octahedral crystal field potential on the'd' wave function – The evaluation of 10 Dq – The tetrahedral potential.

3. FREE ION IN WEAK, MEDIUM AND STRONG CRYSTAL FIELDS:

The effect of a cubic crystal field on S and P terms – on D terms – on F terms – on G, H and I terms – Strong field configurations – Transition from weak to strong crystal fields – term energy level diagrams – Tanabe-Sugano diagrams.

4. BASIC THEORY g-FACTOR:

The g-factor – the general Hamiltonian – The crystal field and orbital symmetry – Symmetry of p and d orbitals – Effect of crystal field – Jahn-Teller distortion and Kramer's theorem – Magnitude of the crystal field – Calculation of g-factors – Ti3+ in octahedral field – The spin-Hamiltonian – effect of field orientation – Fine structure – Zero-field splitting – The Spin-Hmiltonian for V3+ and FeO42- - S-state ions – Mn2+ ion.

5. NUCLEAR HYPERFINE STRUCTURE:

Introduction – General treatment – Isotropic hyperfine interaction – The spin-Hamiltonian – energy levels – Interpretation of isotropic hyperfine coupling constant – Unpaired spin density – Anisotropic hyperfine interaction – The Spin-Hamiltonian energy levels – Interpretation of anisotropic hyperfine coupling constants – the term <(1 – 3 Cos2 / r3)>av

TEXT BOOKS:

1. Introduction to Ligand Fields.

B.N.Figgis, Wiley – Eastern Ltd., New Delhi (1976).

2. Electron Spin Resonance in Chemistry.

Peter B.Ayscough. Methuen and Co.Ltd., London (1964).

3. Instrumental Methods and Analysis.

H.Willard, L.Merritt, J.Dean,F.Settle, CBS publishers and distributors (1986).

4. Fundamentals of Molecular Spectroscopy.

C.N.Banwell, Tata-McGraw-Hill publishing company Ltd, New Delhi (1990).

SPECTROSCOPIC STUDIES ON TRANSITION METAL IONS

Time: 3hrs Max. Marks: 100

Answer any five of the following questions. All questions carry equal marks

1. Explain the effect of octahedral crystal field on the d wave functions and compare the corresponding effect by a tetrahedral field.

2. Describe the effect of cubic crystal field on S, P, D terms in detail.

3. Distinguish between static and dynamic Jahn-Teller effects and their role in the electronic spectra of complex molecules.

4. Explain the energy levels and g-factor for Ti^{3+} in an octahedral field.

5. Explain how spin-orbit coupling is evaluated from the experimental studies on atomic spectroscopy and ESR spectra of crystals.

6. Distinguish between isotropic and anisotropic hyperfine interaction and explain the corresponding spin-Hamiltonian energy levels.

7. Write the spin-Hamiltonian for S-state ions explain each term in it. Give the energy level diagram of Mn^{2+} ion.

8. Write notes on any two of the following.

(a) Zero-field splitting

(b) Tanabe-Sugano diagrams.

K L University
Department of ECE
Pre-Ph.D. Syllabus & Model Paper for V Batch (admitted in 2013-14)

ADVANCED EMBEDDED PROCESSOR ARCHITECTURE

SYLLABUS

ARM Processor as System-on-Chip: Acorn RISC Machine – Architecture inheritance – ARM programming model. 3 and 5 stage pipeline ARM organization – ARM instruction execution and implementation – ARM Co-processor interface.

ARM Assembly Language Programming: ARM instruction types – data transfer, data processing and control flow instructions – ARM instruction set – Co-processor instructions, Thumb Instruction Set.

Architectural Support for System Development: Advanced Microcontroller bus architecture – ARM memory interface – ARM reference peripheral specification – Hardware system prototyping tools – ARMulator – Debug architecture.

ARM Processor Cores: ARM7TDMI, ARM8, ARM9TDMI, ARM10TDMI, the AMULET Asynchronous ARM Processors- AMULET1

Embedded ARM Applications: The VLSI Ruby II Advanced Communication Processor, The VLSI ISDN Subscriber Processor, The OneC™ VWS22100 GSM chip, The Ericsson-VLSI, Bluetooth Baseband Controller, The ARM7500 and ARM7500FE.

Text Books:

1. ARM System on Chip Architecture – Steve Furber – 2nd ed., 2000, Addison Wesley Professional.

2. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st ed., 2004, Springer

References:

1. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM

2. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers.

REAL TIME CONCEPTS FOR EMBEDDED SYSTEMS

SYLLABUS

Introduction: Examples of Embedded Systems, Definition of Embedded Systems, Architecture of Embedded Systems, Real- Time Embedded Systems , Design Issues and Current Trends for Embedded Systems

Hard versus soft Real- Time Systems: Jobs and Processes, Release Times, Deadlines and Timing Constraints, Hard and Soft Timing Constraints, Hard Real Time Systems, Soft Real Time Systems.

A Reference Model of Real – Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency, Functional Parameters- pre-emptivity of jobs, criticality of jobs, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy- Scheduler and Schedules, Feasibility, Optimality and Performance Measures.

Classification of Real Time Scheduling Approaches: Clock- Driven Approach, Weighted Round- Robin Approach, Priority- Driven Approach, Dynamic versus Static Systems, Effective Release Times and Deadlines, optimality of the EDF and LST algorithms, Non optimality of the EDF and LST algorithms, Challenges in validating timing constraints in priority –driven systems Off-line versus On-line Scheduling.

Clock-Driven Scheduling : Notations and Assumptions, Static, Timer -Driven Scheduler, General Structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of Aperiodic Jobs, Scheduling Sporadic Jobs-Acceptance test ,EDF Scheduling of accepted jobs and implementation, Pros and Cons of Clock Driven Scheduling.

Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed Priority v/s Dynamic Priority Algorithms, schedulability test for the EDF algorithm, a schedulability test for fixed priority tasks with short response times-time demand analysis, schedulability test for fixed priority tasks with arbitrary response times: busy intervals, general schedulability test, sufficient schedulability conditions for RM & DM algorithms: schedulable utilization of the RM algorithm for tasks with Di=pi, schedulable utilization of fixed priority tasks with arbitrary relative deadlines

Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumptions and Approaches, Deferrable Servers- Operations of Deferrable Servers, Constant utilization server Scheduling of sporadic jobs-a simple acceptance test in deadline driven systems, a simple acceptance test in fixed- priority driven systems.

Resources and Resource Access control: Assumptions on Resources and Their Usage, Effects of Resource Contention and Resource Access Control, Non-preemptive Critical Sections, Basic Priority Inheritance Protocol, Basic Priority Ceiling Protocol- Definition, computation of blocking time, controlling accesses to Multiple Unit Resources

Real-Time Operating Systems: Overview- Threads and Tasks, The Kernel, Time Services and Scheduling Mechanisms- Time Services, Scheduling Mechanisms, Other Basic Operating System Functions- Communication and Synchronization, Event Notification and Software Interrupt, Memory Management, I/O and Networking

TEXT BOOKS:

1. Real Time Systems – By Jane W.S.Liu -Low Price Edition , Pearson Education Asia
2. Real-Time Concepts for Embedded Systems - Qing Li with Caroline Yao published by CMP Books

WIRELESS CELLULAR COMMUNICATION

SYLLABUS

Introduction to Cellular Mobile Systems: Cellular Mobile Telephone Systems, A Basic Cellular System, Operation of Cellular Systems.

Elements of Cellular Mobile Radio System Design: General Description of the problem, Concept of Frequency reuse channels, Co-Channel Interference Reduction Factor, Handoff Mechanism, Cell Splitting.

Speech Coding for Wireless Systems Applications: Introduction to Digital Signal Processing (DSP) Techniques in Wireless Telephone and Broadcast Systems, Speech Coding Techniques for Audio and Voice – Pulse Code Modulation, DPCM, Delta Modulation, Vocoder and Linear Predictive Coding, Performance Comparison of Speech Processing Techniques.

Radio Propagation and Cellular Engineering Concepts: Fundamental Radio Propagation and System Concepts, Propagation Characteristics, Models of Multipath-faded radio signals – Un modulated Carrier, Envelope and Phase faded, Level Crossing rate and fade Duration, Delay Spread Measurements.

Digital Modulation-Demodulation (Modem) Principles and Architectures: Coherent Modem – Baseband Modem Equivalence, Coherent and Differentially Coherent Binary Phase Shift Keying Systems, Synchronization – Carrier Recovery and Symbol Timing Recovery, Differential Encoding and Decoding Requirement, Quadrature Phase shift Keying – Coincident and offset Types, Pi/4 DQPSK Modems – Architecture.

Interference In Wireless Digital Communication: Carrier-to-Interference and Carrier-to-Noise Limited Systems, Co-channel Interference, Adjacent Channel Interference. Externally caused Co-channel Interference, Definitions and performance of Spectral and Power Efficiency, Relationship of the Bit-Energy to Noise-Density Ratio and the Carrier-to-Noise Ratio, Power Efficiency and Bit-Error-Rate performance in an Additive White Gaussian Noise Environment, Concepts of Diversity Branch and Signal paths; Combining and Switching Methods.

TEXT BOOKS

1. DR Kamilo Feher Wireless Digital Communications, Prentice Hall of India, New Delhi – 1999

2. William Cy Lee, Mobile Cellular Telecommunications, 2nd Edition, MC Graw Hill.

IMAGE AND VIDEO PROCESSING

SYLLABUS

Fundamentals of Image processing and Image Transforms: Basic steps of Image processing system sampling and quantization of an Image – Basic relationship between pixels Image Transforms: 2 – D Discrete Fourier Transform, Discrete Cosine Transform (DCT), Discrete Wavelet transforms.

Image Processing Techniques: Image Enhancement: Spatial Domain methods: Histogram Processing, Fundamentals of Spatial Filtering, Smoothing Spatial filters, Sharpening Spatial filters Frequency Domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, selective filtering Image Segmentation: Segmentation concepts, point, line and Edge detection, Thresholding, region based segmentation.

Image Compression Image compression fundamentals – coding Redundancy, spatial and temporal redundancy. Compression models : Lossy and Lossless, Huffmann coding, Arithmetic coding, LZW coding, run length coding, Bit Plane coding, transform coding, predictive coding , wavelet coding, JPEG standards.

Basic Steps of Video Processing: Analog video, Digital Video, Time varying Image Formation models : 3D motion models, Geometric Image formation , Photometric Image formation, sampling of video signals, filtering operations.

2-D Motion Estimation: Optical flow, general methodologies, pixel based motion estimation, Block matching algorithm, Mesh based motion Estimation, global Motion Estimation, Region based motion estimation, multi resolution motion estimation. Waveform based coding, Block based transform coding, predictive coding, Application of motion estimation in video coding.

TEXT BOOKS

1. Gonzalez and Woods , “Digital Image Processing”, 3rd edition , Pearson

2. Yao wang, Joem Ostarmann and Ya – quin Zhang, “Video processing and communication”, 1st edition, PHI.

REFERENCE TEXT BOOK

1. M. Tekalp, “Digital video Processing”, Prentice Hall International

SIMULATION TEXT BOOKS

1. Relf, Christopher G.,"Image acquisition and processing with LabVIEW", CRC press

2. Aner ozdemi R, "Inverse Synthetic Aperture Radar Imaging with MATLAB Algorithms", John Wiley & Sons.

3. Chris Solomon, Toby Breckon ,"Fundamentals of Digital Image Processing A Practical Approach with Examples in Matlab", John Wiley & Sons.

ADVANCED DIGITAL SIGNAL PROCESSING

SYLLABUS

Multi-rate Digital Signal Processing Introduction, Decimation by a Factor D, Interpolation by a Factor I, Sampling Rate Conversion by a Rational Factor I/D, Filter Design and Implementation for sampling rate Conversion

Multi-rate Digital Signal Processing Multistage Implementation of Sampling Rate Conversion, Applications of Multi-rate Signal Processing, Sampling Rate Conversion of Band-pass Signals

Linear Prediction And Optimum Linear Filters: Innovations Representation of a Stationary Random Process, Forward and Backward linear prediction, Solution of the Normal Equations, Properties of linear prediction-Error Filter, AR Lattice and ARMA Lattice-Ladder Filters.

Power Spectral Estimation: Estimation of Spectra from Finite Duration Observations of a signal, the Periodogram, Use DFT in power Spectral Estimation, Bartlett, Welch and Blackman, Tukey methods, Comparison of performance of Non-Parametric Power Spectrum Estimation Methods

Parametric Method Of Power Spectrum Estimation: Parametric Methods for power spectrum estimation, Relationship between Auto-Correlation and Model Parameters, AR (Auto-Regressive) Process and Linear Prediction, Yule-Walker, Burg and Un-constrained Least Squares Methods, Sequential Estimation, Moving Average(MA) and ARMA Models Minimum Variance Method, Piscaranko's Harmonic Decomposition Methods, MUSIC Method**.**

TEXT BOOKS

1. Proakis JG and Manolakis DG Digital Signal Processing Principles, Algorithms and Application, PHI.

2. Openheim AV & Schafer RW, Discrete Time Signal Processing PHI.

SIMULATION TEXT BOOKS

1. Samuel D Stearns, "Digital Signal Processing with examples in Matlab", CRC Press.

2. ES Gopi. "Algorithm collections for Digital Signal Processing Applications using Matlab", Springer.

3. Taan S.Elali, "Discrete Systems and Digital Signal Processing with Matlab", CRC Press, 2005.

GLOBAL POSITIONING SYSTEM

SYLLABUS

GPS fundamentals: INS, Trilaiteration, Hyperbolic navigation, Transit, GPS principle of operation, architecture, operating frequencies, orbits, Keplerian elements. Solar and Siderial days, GPS and UTC Time

GPS Signals:, Signal structure, C/A and P-Code, ECEF and ECI coordinate systems and WGS 84 and Indian datums, Important components of receiver and specifications, link budget.

GPS Error Models: Ionospheric error, Tropospheric error, Ephemeris error, Clock errors, Satellite and receiver instrumental biases, Antenna Phase center variation, multipath; estimation of Total Electron Content (TEC) using dual frequency measurements, Various DOPs, UERE. Spoofing and Anti-spoofing. : Future GPS satellites, new signals and their benefits GPS integration – GPS/GIS, GPS/INS, GPS/pseudolite, GPS/cellular.

GPS data processing, DGPS and Applications: RINEX Navigation and Observation formats, Code and carrier phase observables, linear combination and derived observables, Ambiguity resolution, cycle slips, Position estimation. principle of operation of DGPS, architecture and errors.

Other Constellations and Augmentation systems Other satellite navigation constellations GLONASS and Galileo IRNS System. : Relative advantages of SBAS and GBAS, Wide area augmentation system (WAAS) architecture, GAGAN, EGNOS and MSAS. Local area augmentation system (LAAS) concept.

Reference Books:

1. B.Hofmann Wollenhof, H.Lichtenegger, and J.Collins, “GPS Theory and Practice”, Springer Wien, new York, 2000.

2. Pratap Misra and Per Enge, “Global Positioning System Signals, Measurements, and Performance,” Ganga-Jamuna Press, Massachusetts, 2001.

3. Ahmed El-Rabbany, “Introduction to GPS,” Artech House, Boston, 2002. WITH EFFECT FROM THE ACADEMIC YEAR 2010-2011

4. Bradford W. Parkinson and James J. Spilker, “Global Positioning System: Theory and Applications,” Volume II, American Institute of Aeronautics and Astronautics, Inc., Washington, 1996.

BIOMEDICAL SIGNAL PROCESSING

SYLLABUS

Introduction To Biomedical Signals - Examples of Biomedical signals - ECG, EEG, EMG etc., Tasks in Biomedical Signal Processing - Computer Aided Diagnosis. Origin of bio potentials - Review of linear systems - Fourier Transform and Time Frequency Analysis (Wavelet) of biomedical signals- Processing of Random & Stochastic signals – spectral estimation – Properties and effects of noise in biomedical instruments - Filtering in biomedical instruments.

Concurrent, Coupled and Correlated Processes - Illustration with case studies – Adaptive and optimal filtering - Modeling of Biomedical signals - Detection of biomedical signals in noise -removal of artifacts of one signal embedded in another -Maternal-Fetal ECG - Muscle-contraction interference. Event detection - case studies with ECG & EEG - Independent component Analysis - Cocktail party problem applied to EEG signals - Classification of biomedical signals.

Cardio Vascular Applications : Basic ECG - Electrical Activity of the heart- ECG data acquisition – ECG parameters & their estimation - Use of multi-scale analysis for ECG parameters estimation - Noise & Artifacts- ECG Signal Processing: Baseline Wandering, Power line interference, Muscle noise filtering – QRS detection - Arrhythmia analysis

Data Compression: Lossless & Lossy- Heart Rate Variability – Time Domain measures - Heart Rhythm representation - Spectral analysis of heart rate variability - interaction with other physiological signals.

Neurological Applications: The electroencephalogram - EEG rhythms & waveform - categorization of EEG activity - recording techniques - EEG applications- Epilepsy, sleep disorders, brain computer interface. Modeling EEG- linear, stochastic models – Non-linear modeling of EEG - artifacts in EEG & their characteristics and processing – Model based spectral analysis - EEG segmentation - Joint Time-Frequency analysis – correlation analysis of EEG channels - coherence analysis of EEG channels.

TEXT BOOKS

1. D.C.Reddy ,“Biomedical Signal Processing: Principles and techniques” ,Tata McGraw Hill, New Delhi, 2005

2. Willis J Tompkins , Biomedical Signal Processing -, ED, Prentice – Hall, 1993

REFERENCES BOOKS

1. R. Rangayan, “Biomedical Signal Analysis”, Wiley 2002.

2. Bruce, “Biomedical Signal Processing & Signal Modeling,” Wiley, 2001

3. Sörnmo, “Bioelectrical Signal Processing in Cardiac & Neurological Applications”, Elsevier

4. Semmlow, “Bio-signal and Biomedical Image Processing”, Marcel Dekker

5. Enderle, “Introduction to Biomedical Engineering,” 2/e, Elsevier, 2005

LOW POWER VLSI CIRCUITS

SYLLABUS

Introduction: Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches.

Device & Technology Impact on Low Power: Dynamic dissipation in CMOS, Transistor sizing& gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.

Simulation Power analysis: SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems, Monte Carlo simulation.

Probabilistic power analysis: Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.

Low Power Circuit's: Transistor and gate sizing, network restructuring and Reorganization. Special Flip Flops & Latches design, high capacitance nodes, low power digital cells library.

Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic.

Low power Architecture & Systems: Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components.

Low power Clock Distribution: Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip & package co design of clock network.

Special Techniques: Power Reduction in Clock networks, CMOS Floating Node, Low Power Bus Delay balancing, and Low Power Techniques for SRAM.

TEXT BOOKS

1. Gary K. Yeap, "Practical Low Power Digital VLSI Design", KAP, 2002

2. Rabaey, Pedram, "Low Power Design Methodologies" Kluwer Academic

REFERENCES

1. Kaushik Roy, Sharat Prasad, "Low-Power CMOS VLSI Circuit Design" Wiley, 2000

2. Yeo, "CMOS/BiCMOS ULSI Low Voltage Low Power" Pearson Education

VLSI SYSTEM DESIGN

SYLLABUS

Design Methodology: Structured design techniques; Programmable logic; Gate array and sea of gates design; cell based design; full custom design; Design flow; Design Economics.

Data path Subsystems: Adders; One/zero Detectors; Comparators; Counters; Shifters; Multipliers; Power and Speed Trade-off.

Memory and Array Subsystems: SRAM, DRAM, ROM, Serial access memories; CAM, PLAs; Array yield, reliability; Power dissipation in Memories.

Special-purpose Subsystems: Packaging; power distribution; I/O pads;

Interconnect: Interconnect parameters; Electrical wire models, capacitive parasitics; Resistive parasitics; Inductive parasitic; Crosstalk; Advanced Interconnect Techniques.

Timing Issues: Timing classification; Synchronous design; Self-timed circuit design;

Clock Synthesis and Synchronization: Synchronizers; Arbiters; Clock Synthesis; PLLs; Clock generation; Clock distribution; Synchronous Vs Asynchronous Design.

TEXT BOOKS

1.Neil H. E. Weste, David. Harris and Ayan Banerjee,, “CMOS VLSI Design” - Pearson Education, Third Edition, 2004.

2.Jan M. Rabaey, Anantha Chandrakasan, Borivoje Nikolic, “Digital Integrated Circuits” Pearson Education, Second Edition.

REFERENCES:

1. 1.Sung-Mo Kang, Yusuf Leblebici, “CMOS Digital Integrated Circuits” TMH, Third Edition, 2003

2. Wayne Wolf, “Modern VLSI Design ", 2nd Edition, Prentice Hall,1998.

SIMULATION BOOKS

1. Etienne Sicard, Sonia Delmas Bendhia, “Basics of CMOS Cell Design”, TMH, EEE, 2005.

CMOS RF CIRCUIT DESIGN

SYLLABUS

Introduction to RF Design and Wireless Technology: Design and Applications, Complexity and Choice of Technology. Basic concepts in RF design: Nonlinearly and Time Variance, Inter symbol interference, random processes and noise. Sensitivity and dynamic range, conversion of gains and distortion

RF Modulation: Analog and digital modulation of RF circuits, Comparison of various techniques for power efficiency, Coherent and non-coherent detection, Mobile RF communication and basics of Multiple Access techniques. Receiver and Transmitter architectures, Direct conversion and two-step transmitters

RF Testing: RF testing for heterodyne, Homodyne, Image reject, Direct IF and sub sampled receivers.

BJT and MOSFET behavior at RF Frequencies: BJT and MOSFET behavior at RF frequencies, modeling of the transistors and SPICE model, Noise performance and limitations of devices, integrated parasitic elements at high frequencies and their monolithic implementation

RF Circuits Design: Overview of RF Filter design, Active RF components & modeling, Matching and Biasing Networks. Basic blocks in RF systems and their VLSI implementation, Low noise Amplifier design in various technologies, Design of Mixers at GHz frequency range, Various mixers- working and implementation. Oscillators- Basic topologies VCO and definition of phase noise, Noise power and trade off. Radio frequency Synthesizers- PLLS, Various RF synthesizer architectures and frequency dividers, Design issues in integrated RF filters.

TEXT BOOKS

1. B. Razavi, “RF Microelectronics” PHI 1998

2. R. Jacob Baker, H.W. Li, D.E. Boyce “CMOS Circuit Design, layout and Simulation”, PHI

REFERENCE BOOKS

1. Thomas H. Lee “Design of CMOS RF Integrated Circuits” Cambridge University press 1998.

2. Y.P. Tsividis, “Mixed Analog and Digital Devices and Technology”, TMH 1996

2. Behzad Razavi, “Design Of Analog CMOS Integrated Circuit**s**”, Tata Mcgraw Hill,2005.

WIRELESS SENSOR NETWORKS

SYLLABUS

Characteristics Of WSN: Characteristic requirements for WSN - Challenges for WSNs – WSN vs Adhoc Networks - Sensor node architecture – Commercially available sensor nodes –Imote, IRIS, Mica Mote, EYES nodes, BTnodes, TelosB, Sunspot -Physical layer and transceiver design considerations in WSNs, Energy usage profile, Choice of modulation scheme, Dynamic modulation scaling, Antenna considerations.

Medium Access Control Protocols: Fundamentals of MAC protocols - Low duty cycle protocols and wakeup concepts - Contention-based protocols - Schedule-based protocols - SMAC - BMAC - Traffic-adaptive medium access protocol (TRAMA) - The IEEE 802.15.4 MAC protocol.

Routing And Data Gathering Protocols Routing Challenges and Design Issues in Wireless Sensor Networks, Flooding and gossiping – Data centric Routing – SPIN – Directed Diffusion – Energy aware routing - Gradient-based routing - Rumor Routing – COUGAR – ACQUIRE – Hierarchical Routing - LEACH, PEGASIS – Location Based Routing – GF, GAF, GEAR, GPSR – Real Time routing Protocols – TEEN, APTEEN, SPEED, RAP - Data aggregation - data aggregation operations - Aggregate Queries in Sensor Networks - Aggregation Techniques – TAG, Tiny DB.

Embedded Operating Systems: Operating Systems for Wireless Sensor Networks – Introduction - Operating System Design Issues - Examples of Operating Systems – TinyOS – Mate – MagnetOS – MANTIS - OSPM - EYES OS – SenOS – EMERALDS – PicOS – Introduction to Tiny OS – NesC – Interfaces and Modules- Configurations and Wiring - Generic Components -Programming in Tiny OS using NesC, Emulator TOSSIM.

Applications Of WSN: WSN Applications - Home Control - Building Automation - Industrial Automation - Medical Applications - Reconfigurable Sensor Networks - Highway Monitoring - Military Applications - Civil and Environmental Engineering Applications - Wildfire Instrumentation - Habitat Monitoring - Nanoscopic Sensor Applications – Case Study: IEEE 802.15.4 LR-WPANs Standard - Target detection and tracking - Contour/edge detection - Field sampling.

TEXT BOOKS

1. Kazem Sohraby, Daniel Minoli and Taieb Znati, " Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.

2. Holger Karl and Andreas Willig, "Protocols and Architectures for Wireless Sensor Networks", John Wiley & Sons, Ltd, 2005.

REFERENCE BOOKS

1. K. Akkaya and M. Younis, "A survey of routing protocols in wireless sensor networks", Elsevier Ad Hoc Network Journal, Vol. 3, no. 3, pp. 325--349

2. Philip Levis, " TinyOS Programming"

3. Anna Ha´c, "Wireless Sensor Network Designs", John Wiley & Sons Ltd,

ANTENNA MEASUREMENTS

SYLLABUS

Antenna Pattern Measurements: Basic Considerations, Pattern Formats, Fresnel Region Measurements, Modeling Techniques.

Antenna Range Design and Evaluation: Introduction, Electromagnetic Design Consideration, Antenna Range Evaluation.

Antenna Testing: Introduction, Types of Ranges: Elevated Ranges, Ground Ranges, Near Field Ranges, Radar Cross Section Ranges.

Far Field Range Design: Introduction, Designing the Range, Source Design, Receiving Site Design, Ground Ranges.

Far Field Antenna Tests: Introduction, Pattern Testing, Gain and Directivity, Polarization.

Far Field Pattern Errors: Introduction, Error Estimates, Error Correction, Antenna Errors.

Compact Ranges: Introduction, Room Design, Feed Design, Reflector Design.

Near Filed Testing: Introduction, Planar Near Field Ranges, Errors, Cylindrical and Spherical Scanning.

TEXT BOOKS

1. Evans, Gray E," Antenna measurements techniques", Artech House, Inc

2. J S Hollis, T J Lyon, L Clayton," Microwave Antenna Measurements" , Scientific Atlants, Inc

EMI AND EMC

Syllabus

UNIT – I

EMI Environment: Sources of EMI, Conducted and Radiated EMI, Transient EMI, EMI –EMC Definitions and Units of Parameters.

EMI Specifications/Standards/Limits: Units of specifications, Civilian Standards and Military Standards

UNIT – II

EMI Control Techniques: Shielding, Filtering, Grounding, Bonding, Isolation Transformer, Transient Suppressors, Cable Routing, Signal control, Component Selection and mounting.

UNIT – III

EMC Design Guidelines: Typical Sub systems in Electronic Equipment, Transmitters, Receivers, Antenna Systems, Power Supplies, Motors, Control Devices, Digital Circuits, Digital Computers.

UNIT – IV

Choice of Passive Components for EMC: Capacitors, Inductors, Transformers, Resistors, Conductors, Ferrite Beads, Coaxial Connectors, Conductive Gaskets.

UNIT – V

EMI Measurements: EMI Test Instrument / Systems, EMI Test, EMI Shielded Chamber, Open Area Test Site, TEM cell Antennas

TEXT BOOKS:

1. V P Kodali, Engineering EMC Principles, Measurements and Technologies, IEEE press, 1996.

2. Bernard Kieser, Principles of Electromagnetic Compatibility, Artech House 3rd Edition, 1986

DETECTION AND ESTIMATION OF SIGNALS

SYLLABUS

Introduction to Discrete-time signals: Fourier Transform of a discrete time signal, Amplitude and phase spectrum, Frequency content and sampling rates, Transfer function, Frequency response.

Random - Discrete-time signals: Review of probability, Random data, Generation of Pseudo-random noise, Filtered signals, Autocorrelation and power spectral density, Sampling band- Limited random.

Detection of Signals in Noise:- Minimum probability of Error Criterion, Neyman-Person criterion for Radar detection of constant and variable amplitude signals, Matched filters, Optimum formulation, Detection of Random signals, Simple problems thereon with multi sample cases.

Estimation of Signals in Noise: Linear mean squared estimation, Non linear estimates, MAP and ML estimates, Maximum likelihood estimate of parameters of linear system, Simple problems thereon.

Recursive linear mean squared Estimation: Estimation of a signal parameter, Estimation of time-varying signals, Kalman filtering, Filtering signals in noise, Treatment restricted to two variable case only, Simple problems.

TEXT BOOKS

1. Signal processing: Discrete Spectral analysis, Detection and Estimation, Mischa Schwartz and Leonard Shaw, Mc-Graw Hill Book Company, 1975.

2. Signal Detection and Estimation, 2nd edition, Mourad Barkat, Artech House Inc, Norwood, MA 02062, 2005,

3. Fundamentals of Statistical Signal Processing: Estimation Theory, Steven M. Kay, Prentice Hall New Jersey, 1993,

REFERENCE TEXT BOOK

1. "Probability, Random Variables and Random Signal Principles", *Peyton Z.Peebles* Jr, 4th Edition, Tata Mc Graw Hill.

2. Jerry M. Mendel, Lessons in Estimation Theory for Signal Processing, Communication and Control, Prentice Hall Inc., 1995.

3. Shanmugam and Breipohl, 'Detection of signals in noise and estimation', John Wiley & Sons, New York, 1985.

4. Srinath, Rajasekaran & Viswanathan, Introduction to statistical Signal processing with Applications, Prentice Hall of India, New Delhi, 110 001,1989.

5. Steven M. Kay, Intuitive Probability and Random Processes using Matlab, Springer, 2006.

SIMULATION TEXT BOOKS

1. Statistical Digital Signal Processing and Modeling by Monson Hayes, John Wiley & Sons, Inc.,

2. Statistical Signal Processing Modelling and ESTIMATION BY Chonavel, T., Springer 2001

MICRO ELECTRO MECHANICAL SYSTEMS

Syllabus

Overview of MEMS and Micro Systems: Introduction, miniaturization, Reliability, Advantages of MEMS, working principles of chemical sensors, optical, pressure and thermal sensors, micro actuation: actuation using thermal forces, actuation using piezo electric crystals, actuation using electrostatic forces; micro accelerometers, micro fluidics, MEMS switches, phase shifters, varactors, tunable oscillators

Basics of MEMS technology: Molecular theory of matter and intermolecular forces, doping of semi-conductors, the diffusion process, scaling laws in miniaturization, Engineering mechanics: static bending of thin plates, mechanical vibrations, thermo mechanics, fluid flow in nano scale.

Micro system Design: Introduction, design considerations, process design, mechanical design, micro system packaging, essential packaging technologies, 3D packaging, assembly, selection of materials, Finite Element Analysis (FEA).

Fabrication methods: Lithography: Introduction, wafers, masks, spinning resist and soft baking, exposure and post exposure treatment, resolution, mathematical expression of resist profiles, image reversal, interface effects, radiation and resist profiles, ion implantation, diffusion, oxidation, RIE , Chemical Vapour Deposition (CVD), Physical Vapour Deposition (PVD), deposition by epitaxy, comparison of bulk and surface micromachining, comparison of wet and dry etching, LIGA process. system level packaging, single and multichip packaging.

Case Study: MEMS capacitive switch, MEMS capacitive accelerometer, MEMS pressure sensor, quartz rate gyroscope, cantilever based micro cantilevers for mass measurement.

References:

1. Microsystem Design by *Stephen D.Senturia*, Springer International Edition,2010
2. RF MEMS Theory, Design and Technology by *Gabriel M.Rebeiz*, Wiley India Pvt Ltd.
3. MEMS and Microsystems: Design and Manufacture by *Tai-Ran Hsu*, Tata McGraw
4. Hill,2002
5. The MEMS Handbook, *Mohamed Gad-el-Hak*, CRC Press, 2002.
6. Foundations of MEMS by *Chang Liu*, Second Edition, Pearson Publication

MEMS MEASUREMENT TECHNIQUES

Syllabus

Introduction: Macro-Meso, Micro and Nanostructure of Materials, Fundamentals of crystallography and Crystal structures Optical Microscopy: Geometry of Optics, Resolution, and Construction of a Microscope, Image Contrast, and Phase Contrast. Electron Microscopy: SEM: Electron Optics - Interaction of Electrons and Matter - Elastic and Inelastic Scattering, Backscattered Electrons, Secondary Electrons,

Materials For MEMS - Substrate and wafer, silicon as a substrate material, silicon compound, silicon Piezo-resistors, Gallium Arsenide, quartz, Piezoelectric crystals, polymers:Polymide,SU-8,Liquid Crystal Polymers, PDMS, PMMA, mechanical properties of polymers and packaging Materials

Microscopy – Image Formation, magnification, and depth of field, distortion, detectors, Contrast, and Resolution. TEM: Electron diffraction, different electron Diffraction techniques, Atomic Force Microscopy(AFM): Construction and principle, Surface & optical profilometry, Semiconductor Material Impurity Characterization: Spectroscopic Ellipsometry (SE), X-ray Reflectivity (XRR), X-ray Fluorescence (XRF), X-ray Diffraction (XRD), Secondary Ion Mass Spectrometry (SIMS), Auger Electron Spectrometry(AES), Rutherford Backscattering Spectrometry, FTIR.

Electrical Characterization- Four-probe technique, Hall Effect, sheet resistance C-V measurements, Carrier lifetime, impurity profiling, I-V measurements

Case Study- Optical characterization of MEMS cantilever, piezoelectric, capacitive, Magneto-motive, piezo-resistive, dielectric gradient, Electro thermal actuation schemes for cantilever sensors.

Reference Books:

1. Fundamentals of Micro Fabrication by *Marc Madou*

2. Microsystem Design by *Stephen D.Senturia*, Springer International Edition,2010

3. RF MEMS Theory, Design and Technology by *Gabriel M.Rebeiz*, Wiley India Pvt Ltd.

4. MEMS and Microsystems: Design and Manufacture by *Tai-Ran Hsu*, Tata McGraw Hill,2002

5. The MEMS Handbook, *Mohamed Gad-el-Hak*, CRC Press, 2002.

6. Foundations of MEMS by *Chang Liu*, Pearson Publications

ADAPTIVE SIGNAL PROCESSING

SYLLABUS

Complex-Valued Adaptive Signal Processing: Optimization in the Complex Domain, Widely Linear Adaptive Filtering, Nonlinear Adaptive Filtering with Multilayer Perceptrons, Complex Independent Component Analysis,

Robust Estimation Techniques for Complex-Valued Random Vectors: Statistical Characterization of Complex Random Vectors, Complex Elliptically Symmetric (CES) Distributions, Tools to Compare Estimators, Scatter and Pseudo-Scatter Matrices Array Processing Examples, MVDR Beamformers Based on M-Estimators,

Turbo Equalization: Communication Chain, Turbo Decoder: Overview, Forward-Backward Algorithm, Simplified Algorithm: Interference Canceler, Capacity Analysis, Blind Turbo Equalization, Convergence, Multichannel and Multiuser Settings,

Subspace Tracking for Signal Processing: Linear Algebra Review, Observation Model and Problem Statement, Preliminary Example: Oja's Neuron, Subspace Tracking,, Eigenvectors Tracking, Convergence and Performance Analysis Issues,

Particle Filtering: The Basic Idea, The Choice of Proposal Distribution and Resampling, Some Particle Filtering Methods, Handling Constant Parameters, Rao–Blackwellization, Prediction, Smoothing,

TEXT BOOKS

1. Tu¨lay Adalı ,Simon Haykin," Adaptive Signal Processing", John Wiley & Sons

POWER QUALITY

SYLLABUS

Unit I: Introduction

Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring

Unit II: Long Interruptions

Interruptions – Definition – Difference between failure, outage, Interruptions – causes of Long Interruptions – Origin of Interruptions – Limits for the Interruption frequency – Limits for the interruption duration – Short interruptions

Unit III: Short Interruptions

Definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

Unit IV: Voltage sag – characterization – Single phase

Voltage sag – definition, causes of voltage sag, voltage sag magnitude, monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, voltage sag duration - Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

Unit V: Mitigation of Interruptions and Voltage Sags

Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller.

Text books:

1. Math H J Bollen, "Understanding Power Quality Problems: voltage sags and interruptions", Wiley-IEEE Press, 1999.
2. Roger C Dugan, Surya Santoso, Mark F. McGranaghan, H. Wayne Beaty, "Electrical power systems quality", Second edition, 2002.

Reference Book:

2. *Angelo Baggini*, "Hand book of power quality", wiley publications, 2008.

POWER QUALITY

Model Question Paper

Time: 3 hours Max Marks: 100

Answer any five questions **5 X 20 = 100M**

1. a) Explain the different Issues of power quality. 12M

   b) Explain the responsibilities of the suppliers and users of electrical power. 8M

9. a) what is an interruption? Clearly differentiate 'Failure', 'Outage' and 'Interruption. 10M

   b) Explain about i) origin and causes of short interruptions ii) fuse saving. 10M

10. Briefly explain the changes in voltage and current during fault period and post fault Period in single phase tripping. 20M

11. A) Describe the procedure for estimating the voltage sag performance. 8M

    b) Explain briefly how sag duration is measured. 12M

12. a). Distinguish different mitigation methods from fault to trip. 10M

    b) Explain the role of combined series and shunt controller for voltage mitigation. 10M

13. a) Explain voltage sag calculation in non- radial system. 10M

    b). what is meant by impulsive transient and oscillatory transient? Explain the causes and effects. 10M

14. a) Explain the methods of monitoring short interruption. 8M

    b) Define the phase term 'phase single jump'. Derive an expression for magnitude and phase angle jump versus distance. 12M

15. a. Explain how equipment immunity can be improved 10M

    c. Describe the operation of a combined shunt and series controller 10M

16. a) Explain voltage source converter and series voltage controller 10M

b) Describe the remedies to improve power quality 10M

RADIATION SYSTEMS

SYLLABUS

Basics Concepts Of Radiation: Radiation from surface current and current line current distribution, Basic antenna parameters, Radiation mechanism-Current distribution of Antennas, Impedance concept-Balanced to Unbalanced transformer.

Radiation from Apertures Field equivalence principle, Rectangular and circular apertures, Uniform distribution on an infinite ground plane, Aperture fields of Horn antenna-Babinets principle, Geometrical theory of diffraction, Reflector antennas, and Design considerations - Slot antennas.

Synthesis of Array Antennas Types of linear arrays, current distribution in linear arrays, Phased arrays, Optimization of Array patterns, Continuous aperture sources, Antenna synthesis techniques.

Micro Strip Antennas Radiation mechanisms, Feeding structure, Rectangular patch, Circular patch, Ring antenna. Input impedance of patch antenna, Micro-strip dipole, Micro-strip arrays.

EMI/EMC/Antenna Measurements: Log periodic, Bi-conical, Log spiral ridge Guide, Multi turn loop, Traveling Wave antenna, Antenna measurement and instrumentation, Amplitude and Phase measurement, Gain, Directivity, Impedance and polarization measurement, Antenna range, Design and Evaluation.

TEXT BOOKS

1. Kraus.J.D.,"Antennas"II Edition, John wiley and Sons.

2. Balanis.A, "Antenna Theory Analysis and Design", John Wiley and Sons, New York, 1982

REFERENCES

1. RF System Design**,** Peter Kinget Bell Laboratories, Lucent Technologies Murray Hill,

2. Practical RF system design, Wiley-IEEE, 2003 - Technology & Engineering

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