बरकतउल्ला विश्वविद्यालय,भोपाल

Barkatullah University, Bhopal

पीएच.डी. प्रवेश परीक्षा हेतु पाठ्यक्रम

Syllabus of Ph.D. Entrance Examination

Session 2012-13

प्रकाशक

कुलसचिव

बरकतउल्ला विश्वविद्यालय,भोपाल

2012–13

INDEX

FACULTY OF ENGINEERING

FACULTY OF TECHNICAL EDUCATION

FACULTY OF ENGINEERING

BARKATULLAH UNIVERSITY, BHOPAL
SYLLABUS FOR Ph.D ENTRANCE TEST
SUBJECT-DIGITAL COMMUNICATION

Time : 3 hrs.
Max. Marks : 100

Note : There will be 100 objective type of questions minimum passing marks will be 40. No negative marking.

COMPUTATIONAL METHODS FOR COMMUNICATION

Solution of linear simultaneous and transcendental equations. Eigen values problems. Iterative method. Jacobi's method. and solution of communication problem. Analytical method. separation of variables orthogonal functions, series expansion, some practical applications of communication. Numerical integration, Euler's rule. Trapezoidal rule. Simpson rule. Newton Cote's method, Newton - Raphson method and Gaussian Quadrature method. Finite Element. method, solution of poisson and wave equations and other communication problems. Basic MATAB function and applications. Fuzzy Set theory and application to communication problems. Fuzzy MATLAB tools OFT. FFT and MAT LAB tools for wavelet transform.

SATELLITE COMMUNICATION

Evolution of Satellite Technology, Communication Satellites, Satellite frequency Bands. Satellite Channel analysis, cross-links, Carrier to Noise ratios, Frequency reuse with spot beams. Multiple beams Satellite front end, Front-end noise Noise temperature, Front end filters. Satellite multiple access methods. FOMA, TOMA. COMA Systems. OS-COMA and frequency hopped COMA, Satellite jamming. Code acquisition and tracking. Satellite applications. Data Communication and VSAT network Mobile satellite services(GEO and NONGEO)

ADVANCED DIGITAL COMMUNICATION

Digital PAM. binary PAM formats, line coding. bandlimited digital PAM systems. Nyquist pulse shaping, equalization, synchronization techniques. bit and frame synchronization. Coded pulse modulation. voice digitization rate (VDR) of PCM, DPCM. DM. ADM. CVSD. log PCM, their performance: comparison, VDR reduction by speech coding. VOCODERS.

noise performance of PCM and DM, Digital multiplexes. AT & T and CCITT hierarchies. quasi-synchronous multiplexes. Digital CW modulation, BPSK. DPSK, DEPSK. QPSK, M'ary PSK, QASK. BFSK. M~ Doubinary encoding. QPR coherent and non-coherent systems. error probabilities in ;~! PSK, DPSK. FSK, QPSK, 16 QAM. MSK, QPR and bit. Matched correlation and optimum filters and symbol error rate. Spread Spectrum techniques: DS. CDMA, FH. PN sequence, Power requirement. PN-C sequence code. and Walsh's code.

ISDN & Value added communication system simulation & Analysis using MATLAB & Simulink Application using communication toolboxes.

OPTICAL COMMUNICATION

Int. to optical communication, principles of light transmission. optical fiber modes and configuration. Mode theory for circular waveguides. single mode fibers. Multi-mode fibers. Numerical Aperture. Mode Field Diameter. V-Number. Fiber Fabrication Technique.

Optical sources. L.E.D's, LASER Diodes, Modal Reflection Noise, Power Launching & Coupling. Population Inversion. Fiber splicing, optical connector, photo detector PIN. Avalanche, Detector Response Time, Avalanche Multiplication Noise Signal Degradation in optical fibers. Attenuation losses. signal distortion in optical waveguides, material dispersion, waveguide dispersion, chromatic dispersion, Intermodal distortion, pulse broadening in graded-index fibers. mode coupling. Advance fiber design: Dispersion shifted. Dispersion flattened. Dispersion compensating fiber. Design optimization of single mode fibers. Coherent optical fiber communication. Modulation Techniques, Misalignment, Fiber to Fiber joints. Optical Fiber Link Design: Rise Time Budget and Link power Budget. Long-Haul systems. Bit error Rate. Line Coding: NRZ. RZ, Block codes, Error correction. WDM concepts and components. operation, fiber grattings, Hologram, Tunable Filters,

Directional coupler.. Dispersion Management.

Optical Amplifiers - EDFA, Photonic Switching.

Optical Networks - SONET/SDH. Optical Interfaces. Ring Topology, Star Architecture

COMPUTER COMMUNICATION

Study or function TCP/IP ref. Model in computer networks. Switching techniques & Switches, Broad band ISDN & ATM. Polling techniques, multiplexing & concentration, LAN components, transmission media used in physical layer, X.25 networks. Queuing theory, Max. Flow Algorithm, Introduction to LAN, WAN, LAN protocols, ALOHA, IEEE standards for LAN High speed finer optic networks, FDDI, SONET satellite networks, packets radio networks. Data link layer protocols, error detection & correction codes in DLL.

Protocol performance evaluation, protocol specification & verification, Routing and congestion in network layer, routing & congestion control algorithms Network layer in Internet and ATM networks. Network synchronization, traffic analysis, Network management in routing control. Connection management in transport layer. Protocols or transport layer Internet transport protocols like TCP, UDP etc. ATM protocols Data security & cryptography techniques, access management in application layer, World Wide Web, e-mail, concept or virtual terminals. Study or different computer networks.

DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS

Discrete Time signals - sequences, representation

Discrete Time Systems - linear, Time invariant, LTI System, properties, constant - coefficient difference equation.

Frequency Domain Representation of discrete time signals & systems

Discrete - Time Random Signals

Z Transform - properties, R.O.C, stability, Causality criterion

Inverse Z- Transform. Recursive and Non recursive systems, Realization of discrete time system

D.F. T - properties, linear and circular convolution

Discrete Cosine transform, relationship between OFT & OCT.

I.DF T , computation of D.F. T : F.F. T - Decimation in time & Decimation in frequency.

F.I.R and IIR Systems: Basic structure of FIR & IIR, Bilinear transformation, Design of discrete time I.I.R filters - Butterworth, Chebychev, Inv. Chebychev, elliptic etc.

Design of F.I.R filters by windowing - rectangular, Bartlett, Hann Hamming, Kaiser window filter, Design method, Relationship of Kaiser to other windows.

Application or MATLAB for design of digital filters

Effect of finite register length in filter design.

Advanced signal processing techniques and transforms: Multirate Signal processing - Down sampling/upsampling, Int. to discrete Hilbert transform, wavelet transform, Haar transform etcApplication or DSP to Speech Signal Processing.

INFORMATION THEORY AND CODING

Information theory: Marginal, joint and conditional entropy, information rate ,mutual information, channel capacity of various channels, Cascaded channels, repetition of signals Shannon's theorem, Shannon- Hartley theorem, BW-S/N ratio trade off, continuous channel,

negative entropy. Coding: Irreducibility, separatibility. coding efficiency, source encoding, Shannon- Fano code, Huffman code, Data compression, Channel encoding - minimum distance, error detection and correction, FEC and ARQ, block code, convolutional codes, cyclic codes, signal error correction, multiple error correction, Burst error correction, Cryptography, Encryption, Decryption.

MODERN TELEPHONE SWITCHING SYSTEMS

Electronic space Division switching :- Stored program control (SPC), switching matrices, multistage switching, enhance services photonic switching. Time Division switching :- Time division space, and time switching, multiplexed switching, combination switching, T -S, T - S- T, switching n-stage combination switching, PBX switching, PBX networking, digital PBX. Traffic Engg. :- Traffic load, Grade of service, ErJang's formulas, blocking modeling switching systems, Blocking model. Subscriber Loop, Dialing Systems :- Switching hierarchy & routing, Transmission plan, numbering plan, charging plan, signalling technique. Local Access Techniques :- Digital subscriber lines, DSL, ADSL etc, WLL, FIL." wireless for local telephone services.

MOBILE COMMUNICATION

An overview of wireless communication systems. First generation analog cellular systems, second generation digital cellular systems, third generation systems standards for wireless communications systems GSM, IMT -2000, UMTS. Mobile Satellite Communication - GEO, LEO, MEO, Terrestrial mobile system. Cellular communication fundamentals. Cellular systems. Geometry of a Hexagonal Cell. Co-channel interference ratio. Cellular system design in worst case with an omnidirectional antenna, co-channel interference reduction with use of directional antenna. Cell splitting Frequency and spectrum management and handoffs Access Techniques. ,,'GSM architecture and interfaces. GSM frequency bands. GSM PLMN. GSM PLMN Services. GSM interfaces. The Radio interface MS to BTS. Abis interface (BTS to MSC). Interface BSC to MSC Radio Propagation and cellular engineering concept. Propagation characteristics. Multipath faded radio signals Radio link design. Receiver sensitivity and link budget. Data services in GSM GSM GPRS. Privacy and security in GSM

DESIGN OF COMMUNICATION NETWORKS

Design considerations: Analog design trade offs - Bandwidth, performance, systems ~complexity. Digital design trade offs - performance, bandwidth. bps/Hz comparisons, digital

communication design requirements. Design features of a computer communication networks: response time. throughput. link design. cost complexity. flow control. security aspects. Design of cellular mobile system: design parameters at the base station. Design parameters at the mobile unit. criteria of signalling design. channel assignment. Case studies: Paging systems. Cellular telephone. Global positioning satellite. Network planning for digital microwave network. optical communication. Satellite networks. design aspects of LAN. MAN and WAN.

INTERNET AND INTRANET

Development of Internet. Designing principles of Internet. Internetworking architecture Internetworking issues. Network layer structure. Internet protocol standards, Internet IP. Ipv6 The ISO Internet protocol. ISO routing protocols. The world wide web: Web fundamentals, URL . Web protocols- HTTP. SSL. Services HTTP other web tools. FTP, HTML. Java. VRML. Jargon IRC. WAIS. Net components: Internet terminology, provider. client & browser, services. viewers. Gateway and Routers. Net applications: e-mail, Netnews, Telnet, e-commerce Network security firewalls, Digital Signature. Intranet and extranet.

DETECTION AND ESTIMATION THEORY

Stochastic signal, orthogonal representation of signals, random process, Markov process, correlation function, power spectral density, Tchebycheffi inequality Detection in presence of noise, correlator, optimum filter, matched filter. Weighted probabilities and hypothesis testing, composite hypothesis, likelihood ratio detection, sequential detection. Principles of estimation, proper1ies of estimator, Cramer - Rao Bound, Baye's maximum likelihood and least square estimation, parameter estimation, estimation of continuous waveforms, time invariant linear estimation

DIGITAL IMAGE PROCESSING

Introduction to Image Processing System:

Digital Image Fundamentals: Image model, Relationship between pixels, Imaging Geometry, Camera model.

Manipulation on Images:

Images Transformation: Introduction to FT, DFT & FFT. Walsh transformation, Hadamard transformation, Hotelling transformation, Histogram.

Image Smoothing:

Neighbourhood averaging, Median filtering lowpass filters, average of multiple images, Image sharpening by differentiation technique, High pass filtering.

Image Restoration:

Degradation models for continuous function, effect of diagonalization. On degradation. Algebraic approach to restoration Interactive restoration, gray level interpolation.

Image Encoding & Segmentation:

Encoding: Mapping, Quantizer, Coder

Segmentation: Detection of discontinuation by point detection, line detection, edge detection. Edge linking & boundary detection: Local analysis, Global by graph theoretic techniques,

Thresholding : Definition, Global thresholding

Filtering: Median, Gradient .Simple Method of representation signatures, Boundary Segments, Skeleton of region

MICROWAVE and MILIMETER WAVE COMMUNICATION

MICROWAVE COMMUNICATION

Microwave radio system: Transmitter & receivers block diagram, FM microwave repeater, divestuly protection, microwave terminal station, repeater station I Microwave links: Block design path characteristics, system pain, free space path, i SIN ratio. I Microwave digital communication block diagram, regeneration repeater, digital modulation & demodulation at microwave frequencies analog & digital multiplying, line codes. Local microwave distribution system. Propagation of microwave: line of sight, duct propagation as super refraction, Troposcatter links. beams. Satellite front end, Front-end noise. Noise temperature Front end filters. Satellite multiple access methods, FDMA. TDMA, CDMA Systems, DS-CDMA and frequency hopped CDMA, Satellite jamming, Code acquisition and tracking. Satellite applications. Data Communication and VSAT network. Mobile satellite services (GEO and NONGEO).

MICROWAVE MEASUREMENTS

Microwave power measurements Measurement of low, medium and high microwave powers. Slotted line techniques for VSWR Measurement. Measurement of high VSWR using double minima method. VSWR Measurement using reflectometer techniques. Impedance Measurement. Measurement of scattering parameters using network analyzer. Frequency

Measurements. Slotted line method and frequency meter. Measurement of Q for transmission type cavity. Antenna Measurement (gain, radiation pattern, impedance) etc. Dielectric Measurement. swept frequency Measurements.. Measurement using spectrum: analyzer.

RADAR ENGINEERING

Prediction of range performance, Minimum Detectable signal, Receiver Noise, Probability. Density function, signal to noise ratio, cross section of target, cross section fluctuation, pulse repetition freq and range ambiguities. CW and freq Modulated radar, MTI, Pulse Doppler radar. Tracking radar phased array radar, synthetic aperture radar, Air surveillance radar, millimeter wave, laser radars. Radar Transmitter power, Various transmitter tubes and their characteristics, modulators, Line type modulator, hard tube modulator solid state transmitter. Radar Antenna: Antenna parameters, Antenna Radiation pattern, Aperture distribution Pattern synthesis, effects of errors on radiation pattern, stabilization of antenna parabolic reflector antenna, Scanning feed reflector antenna, lens antenna, electronically steered phased array antenna Detection of Radar signal in Noise, detection criteria, matched filter receiver, correlation detection, detector characteristics, ECM (Electromagnetic Compatibility), ECCM (Electronic Counter- Counter measurement) CFAR (Constant False Alarm Rate) Receiver, Radar Signal design and corresponding receiver design, Millimeter wave radar

CRYPTOGRAPHY AND DATA SECURITY

Internet and Communication Protocol, A brief history of Internet OSI TCPIP, the need for tunnelling and encryption keys, Tunnelling, Internet Protocol security. Deterring Needs- The evaluation of security assessments, assessing needs in house, the management role, web access question. Containers network bulneralility detection, penetration testing internal security needs. Structured query language security and other specialties. Trends in Internet crime. Denial of service attack, tools, that works for and agmust the Network, IP Spoofing attade the Telnet hole, Language vulnerabilities. Other-Java and Active X, Unix root control, Trojan Hares. Virtual private network, Fire walls and disaster recovery planning, Security tools. Different encryption & decryption algorithm concept of private & Public keys.

COMPUTATIONAL METHOD FOR ELECTROMAGNETICS

Solution of linear simultaneous and transcendental equation, Eigen values problems, Iterative method. Jacobi's method, and solution of electromagnetic problem. Analytical method separation of variables orthogonal functions, series expansion, boundary value problems

some practical application of electromagnetic. Numerical integration, Euler's rule, Trapezoidal rule, Simpson rule, Newton Cote's method, Newton - Raphson method and Gaussian Quadrature method, Finite Element method solution of Poisson and wave equation and other electromagnetic problems. Basic MATLAB function and application. Fuzzy Set Theory and Application to Microwave problems, fuzzy MAT LAB tools. Finite element, Effective dielectric constant, mode matching other analytical tools for solving field problems.

OPTICAL COMMUNICATION

Introduction To optical communication, principles of light Transmission, optical fiber modes and configurations, Mode theory for circular wave-guides, Single mode fibers multi-mode fibers, Numerical Aperture, Mode field Diameter, V-number, Fiber materials, Fiber fabrication Techniques. Optical Sources, LED'S LASER Diodes, Modal reflection Noise, Power launching and coupling, population Inversion, Fiber splicing, optical connectors, Photodetectors, PIN, Avalanche, Detector Response Time, Avalanche Multiplication Noise. Signal Degradation in optical fibers, attenuation, losses, Signal distortion in optical waveguide, Material Dispersion waveguide Dispersion, chromatic Dispersion, Intermodal Distortion, pulse broadening in graded index fiber, Mode coupling, Advance fibre designs: Dispersion shitted, Dispersion flattened, Dispersion Compensating fibre, Design optimization of single mode fibers. Coherent optical fiber communication, modulation techniques for Homodyne and Heterodyne systems. Optical fiber link design: Rise Time Budget and Link Power Budget, Long - Haul Systems. Bit error rate, Line coding NRZ, RZ Block codes, Eye pattern. Advance Systems and Techniques, Wavelength Division Multiplexing, opt~1 Amplifiers: Semi conductor Amplifier, EDFA, optical Amplifier: Gain, Bandwidth: Photonic Switching, Optical Networks: Optical fibre Bus, Ring Topology, STAR Architectures, FDDI, SONET.

VLSI DESIGN

Review of logic design fundamentals - Combinational logic. K- maps. designing with NAND and NOR gates. Hazards in combinational networks. mealy sequential n/w design. Moore sequential n/w. Synchronous design. m/c design. Introduction to VHDL-VHDL description & combinational N/W. modelling flip flops multiplexes using VHDL Processes. Compilation & simulation of VHDL Code. modelling a sequential m/c. variables. signals & constants. Arrays. VHDL operators. . functions & procedures. packages and libraries. Attributes. Multivalued logic and signal resolution. IEEE 1164 standard logics. Generics. Generate

statements. synthesis of VHDL code, synthesis examples, files & TEXTIO. Designing with programmable logic del/ices ROM, PLA'S. PAL'S. PLD'S.. designing with programmable gate arrays. FPGA'S. CPLD'S (Complex programmable logic devices).

Floating point arithmetic - Multiplication & other operation. Hardware testing and Design - Combinational logic testing. sequential logic testing, scan testing. boundary scan . built in self test Design Examples & Case studies - USART design. micro controller design, design of~ micro controller CPU . filter design etc.

MICROWAVE COMMUNICATION

Microwave radio system: Transmitter & receivers block diagram. FM microwave repeater. diversity protection switching microwave terminal station, repeater station Microwave links: Block diagram. path characteristics, system gain, free space path loss, SIN ratio. Microwave sources: Vacuum tube & solid state devices. microwave modulators microwave amplifiers, transmitting & receiving antennas, microwave detectors. Microwave components: waveguide, joints. Tees. frequency meters, attenuators, ferrite devices. direction couplers etc.

MOBILE COMMUNICATIONS

An overview of wireless communication systems First generation analog cellular systems, second generation digital cellular systems, third generation systems standards for wireless communications systems. GSM, IMT -2000, UMTS Mobile Satellite Communication - GEO. LEO. MEO, Terrestrial mobile system. Cellular communication fundamentals Cellular systems. Geometry of a Hexagonal Cell Cochannel interference ratio. Cellular system design in worst case with an unidirectional antenna, cochannel interference reduction with use of directional antenna Cell splitting. Frequency and spectrum management and handoffs Access Techniques. GSM architecture and interfaces. GSM frequency bands, GSM PLMN, GSM PLMN Services, GSM interfaces. The Radio interface MS to BTS. Abis interface (BTS to MSC). Interface BSC to MSC. Radio Propagation and cellular engineering concept. Propagation characteristics. Multipath faded radio signals. Radio link design Receiver sensitivity and link budget. Data services in GSM. GSM GPRS. Privacy and security in GSM

INTERNET & INTRANET

Development of Internet, Designing principles of Internet, Internetworking architecture

Internetworking issues. Network layer structure, Internet protocol standards, Internet IP. Ipv6 The ISO Internet protocol, ISO routing protocols. The world wide web: Web fundamentals,

URL , Web protocols- HTTP. SSL , Services HTTP other web tools, FTP, HTML. Java. VRML. Jargon IRC. WAIS. Net components: Internet terminology, provider. client & browser, services, viewers. Gateway and Routers Net applications: e mail, Netnews, Telnet, e commerce Network security firewalls. Digital Signature. Intranet and ex1ranet.

DIGITAL SIGNAL PROCESSING

Discrete Time signals - sequences, Discrete Time Systems, LTI systems, Frequency Domain Representation of Discreet Time Signal, Constant - Cotto Difference, equation. Z -Trans form Properties, R. O.C. Inverse Z- Trans form Recursive & Non Recursive System. D.F. T. - Properties, Linear & Circular Convolution. I.D.F. T –

Computation of D.F. T: FFT Decimation in Time & Decimation in Frequency.

I.I.R systems: Basic structure of FIR & II.R, Bilinear Transformation. Design of Discrete Time IIR. filters - Butterworth, chebychev, Inv. Chebycbeu. Elliptic etc Using MATLAB.

F.I.R. Systems :- Design of F.I.R. filter by windowing - Rectangular. Bartlett. Hann. Hamming. kaiser window filter design method. relationship of Kaiser to other windows. Application of MATLAB for Design of Digital Filters, Effect of Finite Register Length in Filter Design.

DIGITAL COMMUNICATION AND CODING

Sampling Theorem, PAM, TOM. PCM, OM, ADM, DPCM, Systems. Digital Modulation, ASK. FSK, PSK, BPSK, QPSK, Mary PSK Systems. Entropy. Information Rate, Mutual Information, Channel Capacity, Shannon's Theorem, Shannon Hartley Theorem. Source coding. Shannon - Fanon code. Huffman code, Channel Coding, Hamming's SEC Block code. Convolution Code. Cyclic Code.

MICROWAVE THEORY AND TECHNIQUES

Characteristics features of microwaves, applic3tions of microwaves, Maxwell's equations, plane wave in dielectric and conducting media, waveguide analysis, VSWR, and impedance, waveguide discontinuities. Microwave Network Representations: S-matrix representations, matrices of some typical microwave components such as attenuator, matched load, power divider, directional coupler, magic tee etc. Ferrite devices, wave propagation in ferrite medium, faraday rotation, isolator, circulator etc.

ANTENNA ENGINEERING

Radiation. retarted potential. radiation field from current element antenna, radiation, power and radiation resistance of short dipoles & half dipole antennas, directivity and gain calculation. Antenna as an aperture. resonant and traveling wave antenna for different wavelength, antenna arrays. Binomial and Dolph-Chebychev optimum distribution. Image antenna, patterns & principle of pattern multiplication. Helical antenna. Lens antenna, parabolic reflector frequency independent antenna. Horn antenna. Moment method and its application to a wire antenna, Hallen's integral equation & its solution. Surface wave, leaky wave & dielectric corrugated antennas.

MICROWAVE & MILLIMETER WAVE INTEGRATED CIRCUITS

Analysis of strip lines, microstrip lines, other microstrip like planer transmission lines etc. analysis of slot lines and coplanar guides quasi- static approach and fullwave discontinuities. Microstrip line charectcuization of bends & junction. Lumped element in MICs; Technology of hybrid MICs. Design of MIC components- transitions, couplers, filters, Power dividers, oscillators, modulators, phase shifters & amplifiers Analysis of basic transmission lines for millimetre wave frequencies-Integrated fin line, insulated image guide, trapped guide, non-radiative guide, groove guide. Transitions, bends and discontinuities at MM waves Measurement techniques Design of millimeter wave components, couplers, power dividers, filters, oscillators, switches, phase shifters and amplifiers.

MICROWAVE DEVICES

Microwave diodes and circuits, varactor diodes, millimeter wave varactor diodes. Detailed calculations of varactor characteristics, Manley Rowe power relations, Varactor applications in a Parametric amplifier and up and down convener. P-I-N diodes. Use of P-I-N diode as a microwave switch. limiters and phase shifters. Schottky barrier devices: Detector and mixer diode circuits. Tunnel diodes. Avalanche transit time devices, bulk Gallium Arsenide devices. Microwave linear beam tubes Klystrons, Reflex Klystron, TWTs Crossed feed tubes magnetrons backward and forward cross feed amplifiers and oscillators.

BARKATULLAH UNIVERSITY, BHOPAL
SYLLABUS FOR Ph.D ENTRANCE TEST
SUBJECT - COMPUTER SCIENCE AND ENGINEERING

Max. Marks : 100

Note : There will be 100 objective type of questions minimum passing marks will be 40. No negative marking.

ADVANCED DATA STRUCTURE AND ALGORITHM –

Introduction to basic data structure , Randomized algorithm, a min-cut algorithm, Las Vegas and Monte Carlo, /Binary Planner Partition , a probabilistic recurrence ,computational model & complexity classes.The fundamental Data-structure problem. Random treaps, Mulmuley games, analysis oftreaps, skiplists.Analyzing random skip lists, Hash families, strongly universal hash families , Hashing with O(1) search time, Nearly perfect hash families , achieving bounded query timestorage management, markov chains .Graph connectivity, Random walks on graph , on line paging algorithm, adversarymodels.Genetic algorithms & its application .Parallel & distributed algorithms.

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DISTRIBUTED COMPUTING –

Introduction to the distributed systems, Pros and Cons of distributed Processing, distributed databases, distributed Resources, distributed Networks management. Design Considerations; Communication line loading , Partitioning and Allocation, Network Data Base design Consideration .data Communications distributed Networks-Uylessd, Black. Fundamental of Network and distributed Operating System, Remote Service Robustness Design issues, distributed file system , Naming and Transparency, Remote file Access, File replication , Distributed coordination ; Event ordering, Mutual exclusion, Atomicity, concurrency control, Deadlock handling, various algorithms. Distributed shared Memory; Architecture, Design & Implementation issues, Granularity, structure, replacement strategy, Thrashing synchronization : clock synchronization, Event Ordering, Mutual Exclusion Process Management: Process Migration Threads. Case studies: Amoeba, V-System , Mach, Chorus.

COMPUTATIONAL MATHEMATICS –

Real Analysis : Functional of several variables, continuity; partial derivatives; Taylor's theorem, applications to stationary value problems; Language multipliers; directional derivatives, the operators div, curl, grad; Jacobians, Jacobian theorems; double, triple, line and surface integral; theorems of Gauss and Stokes: applications. Algebra: n-Dvectors, vector spaces, linear dependence . Determinantsand matrics of order n-Rank, eigen values, quadric forms, applications. Barkatullah University Institute of Technology, B.U., Bhopal Basic MATLAB function and applications. Fuzy Set Theory and application to communication problems, Fuzzy MATLAB tools. DFT,FFT and MATLAB tools for wavelet transform.

OBJECT ORIENTED MODELING & DESIGN

Overview of Object Oriented concepts :

Need for Object Oriented Programming, characterization of Object oriented languages Object Oriented Design : Objects structure concepts, methodology for object oriented design(Booch,& chen & chen) ,Design modelling, system design life cycle Object oriented programming : an overview of C++ programming ,loops and decisions, structures and functions, objects and classes , array and pointers, Inheritance , virtual functions files and stream Object oriented data bases :relational V\s object oriented dat bases .the architecture of OO databases ,query languages for OO databases ,Gemstone\O2\orion .

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NETWORK SECURITY AND CRYPTOGRAPHY

Basic concepts: Information Systems reviewed; Batch Systems ; On-line Systems ;Wide Area Networks(WAN), Metropolitan Area Networks(MAN),Local Area Networks(LANs: applications types) Security defined ; Roles. Models: Characteristics of security models, Reference monitor concept, Formal SecurityModels – Harrison- Piazzo model, Ulman Model, Bell La-Fadila Model, Object-orientedModel, Clares Willson, Chines Wall Model,etc.

Information Flow , Role based access control. Covert channels, Security mechanisms inOperating Systems. Policy Paradigm: Meta policies.Implementing a security model , formal specifications and verification methodologies.

Targets; Facility , Hardware , Software ,Applications, Data Communications, Procedures (Administrative), Personnel.Threats to Security: Areas of vulnerability, Physical Security, Data Security, SystemsSecurity, Computer System Security, Communication Security, Personnel SecurityThreat Perpetration: Sources. Manmade, accidental. Threat prevention

measures. Identity verification , Cryptography. Disaster recovery and Contingency Plan , Security Management , The future of Computer Security.

ARTIFICIAL INTELLIGENCE & FUZZY LOGIC

Game Playing: Overview, Minimax search procedure, adding Alfa-Beta cutoffs,
Additional Refinements ,Iterative Deepening, References on specific Games
Planning : Overview. An Example Domain components of a planning system Goal Stack planning, nonlinear planning using constraint posting hierarchical planning, reactivesystems Other Planning Techniques Understanding: what is understanding? What makes understanding hard? Understandingas constraint satisfaction Natural Language Processing: Introduction ,Syntactic Processing. semantic analysis,Discourse and pragmatic processing Parallel in distributed AI: Psychological Modeling, parallelism in Reasoning Systems,distributed Reasoning systems. Learning: rote learning, learning by taking advice ,learning in problem solving, learningfrom examples , explanation based, discovery, analogy, formal learning theory, neural netlearning and genetic learning. Connectionist Models :Introduction, learning in neural networks, applications of neuralnetwork, Recurrent networks, distributed Representations, Connectionist AI andsymbolic AI ,case studies, of NNs in pattern recognition, Image processing, Computervision etc.Common Sense: Qualitative Physics, Common Sense, ontologies ,memoryorganization,case based reasoning.
Fuzzy Logic: Introduction, Fuzzy Set Theory, Fuzzy Set Relations, statistical decisionmaking, Introduction to Fuzzy Logic Controllers, various Fuzzyfication andDefuzzification methods.

COMPUTER AIDED DESIGN

Introduction:
The nature and role of design, the nature of CAD, type of CAD system, concept of integrated CAD benefits of CAD, the price of CAD, system, origin of CAD, applications of CAD.

Computer aided design system hardware:

Introduction graphics input devices as light pens, analog devices, keyboard devices etc. graphics display devices as CRT displays, plasma panel display etc. graphics output devices as pen plotters, electrostatic plotters other, graphics output devices and modes of their operation , CAD system configuration .

Computer aided design system software:

Introduction operating system, the overlay graphics systems, graphics database handling and structure, operating features, symbols, macros, editing facility, data selection , graphics transformation plotting, graphics standards as GKS and CORE, GKS 3-D and PHIGS, IGIS others graphics standards. Transformation systems: Display, windowing and clipping, two dimensional transformation, three dimensional transformation, linear transformation, display files of three dimensional data, visualization of three dimensional data, eye co-ordinator system, joystick function, distortion. Use of micro computers in CAD system: Microcomputer systems, CAD system based on microcomputers, choice of microcomputer system by considering microprocessor, primary memory, backup storage, communication system, software for CAD system. Computer aided design of filters, printed & integrated circuits.

ADVANCED COMPUTER ARCHITECTURE

Flynn's & Handler's Classification of parallel computing structures.Pipelined & Vector Processors. Data & control hazards and method to resolve them. SIMD multiprocessor structures. Interconnection networks. Parallel algoritms for array processors. Search algorithms, MIMD multiprocessor Systems, Scheduling and load balancing in multiprocessor systems, Multiprocesing control and algorithms.

ARTIFICIAL NEURAL NETWORK

Ann Definition, Taxonaomy of neural net classifiers for fixed patterns, Mc-Culloch & Pitts Model, structure and working of human brain & comparison with basic ANN model, single layer network. Perceptron training algorithm, linear separability, Hebb's learning rule, widrow & Holf's learning rule / Delta rule, ADALINE, MADALINE, Comparison of ANN with human brain and AI characteristics and application of ANN.

Multilayer perception, problem with linear activation function, different activation functions like sigmoidal/squashing function, linear threshold function, hyperbolic tangent and Guassian function. Rumelbart's error back propogation algorithm (EBPA) with proof, momentum, limitations, characteristics and Application of EBPA, case study : NETTALK, two dimensional pattern recognition etc. Unit III

Fast training of MLP : EBP using direct solution methods (EBPVDS) , DR symmetric Guassian Elimination Method (DRSGE) , Random MBD (Minimum Bit distance) Gram-Schmidt methods (RMGS), case study: Function approximations, Pattern recognition and vowel recognition. Counter Propagation Network: Network Structure, functioning in Normal & Training mode, characteristics of CPN.

Deterministic v/s statistical training, Boltzman training, Cauchy training, Artificial specification methods. Hopfield /recurrent network, configuration, stability constraints, Associative memory characteristics, limitations and applications Hopfield v/s boltzman machine. Competitive learning : concepts, weight change, example 7 characteristics, lateral inhibition : concepts & examples. Kohonen self-organizing feature map resemblance with human brain, feature map
algorithm- how alpha and d changes with time, examples and properties. Adaptive Resonance Theory(ART): Architecture, classification, implementation & training. Optical neural network, Cognitron and Neocognitron.

DATA CENTRE MANAGEMENT

Introduction to data centre management , Pros & Cons of data centre management, Internet data centre, Data centre fabric, Scale up Versus scale out, Resource consideration for data centre, Virtual data centre and its securities. Infrastructure management, Load Balancing and Distribution, Dynamic Power variation in data centre, Strategies for deploying Blade Server in existing data centre, Web Servers for Data centre, Application server, Power and Energy management for server systems. On loading for Data centre servers. Performance consideration for data centre. Security and Control issues of Data centre, Best practices for security and performance. Study of various data centre softwares.

FAULT TOLERANT & REAL TIME SYSTEM

Fault detection and diagnosis, System Reliability and methods of improving it. Theory of Redundant System design. Fault tolerant circuit design. Fault tolerant architectures. Components of a real time system. Real time operating system, tasks and task scheduling, task synchronization and data transfer factors in selecting a real time operating system. The design specifications, the development environment, ASM Diagram and Data flow analysis. Response time specification.

ADVANCED SOFTWARE ENGINEERING

Introduction, Software life –cycle models, software requirements specification, formal requirement, specification-axiomatic and algebraic specification, Function –oriented software design ,object oriented design, UML, coding and unit testing, data design architectural styles & pattern architectural design ,assessment of

alternate ,architectural design ,mapping data flow into software architecture Modeling component level design, S\W reuse, Software quality & testing—SEI CMM and ISO-9001,software reliability and fault –tolerance, computer aided software engg.(CASE), Web Engg.. Formal Methods ,clean room software Engg, component based development ,software reengg,.

ADVANCED DBMS –

Overview of Database Management, Conceptual Database Design, Logical Database Design, Physical Database Design, Query Processing, Transaction processing, Crash recovery, Concurrency control, , Distributed Database, client/server database. Integrity security and repositories. Emerging Database trends, Design and database administration skills based on near-real life applications.

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COMPUTER GRAPHICS AND ANIMATION –

Transformation and Projections. Bresenham's line drawing algorithm, Homogenous coordinate system(2D & 3D), transformation matrices for translation, scaling, rotation,, shear rotation about an arbitrary axis(3D), parallel projection, perspective projection, clipping, Sutherland cohen algorithm, cyrusbeck algorithm curves & surfaces, Development of Bresenham's algorithm to draw octant of a circle, Bezier curves, Bspline curves, solid modeling, Hidden surface removal, shading, introduction to multimedia, Non Temporal media, Audio, Video, Graphics animation..

PARALLEL COMPUTING

Parallel processing, Parallel computer structure, designing of parallel algorithms,

analyzing algorithms, general principles of parallel computing, Parallel sorting

algorithms, Batcher's bitonic sort. Bitonic sort using the perfect shuffle, parallel bubble sort, add-even transport sort, Tree sort, quick sort, sorting on the CRCW, CRFW, EREW models, searching a sorted sequence, CREW,CRCW,&EREW searching, searching on arandom sequence EREW,ERCW,CREW & CRCW searching on the tree, mesh .anetwork for

merging ,merging on the CRFW,ERFW models, computing FourierTransforms, Computing the DFT in parallel, a parallel FFT algorithm

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EMBEDDED SYSTEM

Hardware fundamentals:-Gates, timing diagram, memory, microprocessor, buses, DMA. Interrupts:-Microprocessor architecture, interrupts basics, Interrupt latency, shared data problem. System partitioning, building the architectural model, Input and output processing,Hardware and software portioning, timing requirement.

Microprocessor selection, Microprocessor versus micro-control analysis CISC versusRISC study of major embedded Microprocessor architecture memory system design . system optimization architecture for embedded software:- round robin, found robin withinterrupts. Function-queuescheduling and real time operating system. Real time operating system:- tasks and task states. Task and data. Semaphores andshared data operating system service:- inter task communication . timer service.Memeory management . events and interaction between interrupt routines and real timeoperating system . software selection issues. Selection an RTOS. RTOS performancemetrice . RTOS scalability and tool support compiler selection

Embedded system design using real time operating system : encapsulating semaphores and queues.hard real time scheduling consideration saving memory space. Development tools and debugging :-hosh and target machines. Linker/location. Target system tasting. Instruction set. Asset macro. Establishing a software development environment C runtime environment embedded debuggers Cross- development methods embedded file formats . readers creating object files- the build process loading software on to remote targets.

WEB TECHNOLOGY & E-BUSINESS

Basics of Electronics commerce, Characteristics of Electronics products, Digital cash and payment systems, Financial Services, Information Markets, Product choices, Internet, Infrastructure and pricing, Intranets, Firewalls Security Issues, Authentication and non repudiation of transactions, Distributed Application Architecture for Electronics commerce. Customer front end design production and supply- chain work flow in e-commerce. Concepts & Principles of e-governance issues, features and security in e-governance.

NATURAL LANGUAGE PROCESSING

Introduction; Goals of natural language processing and computational Linguistics. Finite state automata and transducers, Morphology. Parsing: Context free Grammers, Generalized phrase structure Grammer, Earley Parsing

Algorithm. Transformational grammer, computational models and knowledge representations, semantics; Interpretation, time, tense, lexical semantics , machine translations, Natural Language Interfaces, Natural Language Generators.

.

ROBOTICS AND COMPUTER VISION

Basic components of robotics system, Kinematics and manupulators, selection of Coordinate frames, Homogeneous transformation, solution of kinematics equations, Lagrangian equations and manipulator dynamics,Control design,Languages for Robots and Applications. 3D-vision,Prespective vision,CCD camera study,real time processing, Segmentation using Genetic Algorithm:Adaptive algorithm for indore scene, and outdoor scene. Interpretation of pictures, shape recognition, dynamics scane analtsis. Introduction to AGV, clustering and non supervised learning method.

ADVANCED COMMUNICATION

Digital PAM. binary PAM formats, line coding. band limited digital PAM systems.

Nyquist pulse shaping, equalization, synchronization techniques. bit and frame synchronization. Coded pulse modulation. voice digitization rate (VDR) of PCM, DPCM. DM. ADM. CVSD. log PCM, their performance: comparison, VDR reduction by speech coding. VOCODERS. noise performance of PCM and DM, Digital multiplexes. AT & T and CCITT hierarchies. quasi-synchronous multiplexes. Digital CW modulation, BPSK. DPSK, DEPSK. QPSK, M'ary PSK, QASK. BFSK. M~ Doubinary encoding. QPR coherent and non-coherent systems. error probabilities in ;~! PSK, DPSK. FSK, QPSK, 16 QAM. MSK, QPR and bit. Matched correlation and optimum filters and symbol error rate. Spread Spectrum techniques: DS. CDMA, FH. PN sequence, Power requirement. PN-C sequence code. and Walsh's code. ISDN & Value added communication system simulation & Analysis using MATLAB & Simulink Application using communication toolboxes.

SOFTWARE PROJECT MANAGEMENT

Managing software projects Software product, process and project management CMM,KPAs. For project management, software process Improvement, resources management, team work

and structure, training, project metric, documentation, project management. For conventional and object oriented software projects, software project, knowledge based management Project planning. Project planning infrastructure, process planning feasibility analysis cost and efforts estimation, models and technique, risk analysis and RAMM plan, project scheduling and tracking plan .SQA and quality planning ,SCM activities and plan , project management plan.

PROJECT EXECUTION AND CLOSURE

Data collection, measurement, reviews, monitoring and control , status reporting ,process input and output synchronization, deliverables , milestone recording and their analysis , defect analysis and prevention , audits Project closure analysis and reporting. Project management for special classes of software project - Using CASE tools, CASE, re-engineering ,reverse ,forward engineering Client/server software engineering, web engineering , outsourcing , software project management standards

BIOINFORMATICS

Bioinformatics – an overview

Introduction, objectives of bioinformatics, kind of data used, information molecules, basic structures of nucleic acids, DNA ,RNA, DNA sequencing and polymerise chain reaction(PCR), proteins structure, functions, protein folding and characterization. Biological Databases Introduction, types of databases, nucleotide and protein sequence database,major bioinformatics databases, Introduction to biostatics, data integration,data analysis. Operating systems (LINUX, UNIX), HTML, XML, CML,BSML, etc,.Sequence analysisModels for sequence analysis, methods for alignment (Dot matrices),methods for optimal alignment (gap penalties and storing matrices), tools forsequence alignment – Fasts, BLAST, PSI –blast, Multiple Sequence Alignment(MSA)– tool and applications. Phylogenetic analysis Phylogenetic trees, distance matrix (MD) and character based methodas,gene prediction tools , gene mapping, DNA sequencing, algorithms foralignment of sequencing fragments, DNA micro arrays.

ProteomicsProteomics analysis, tools for proteome analysis, different structural proteins, protein classification, methods of structure prediction (known folds and unknown folds), protein function prediction, metabolic pathways , gene networks their properties and analysis.

DATA MINING AND ITS APPLICATIONS

1 Introduction:

Data mining: Definitions, KDD v/s Data Mining, DBMS v/s Data Mining. DM techniques, Mining problems. Issues and Challenges in DM, DM Application areas.

Association Rules & Clustering Techniques:

Introduction, Various association algorithms like Apriori, Partition, Pineer search etc,. Generalized association rules. Clustering paradigms: Partitioning algorithms like KMedioid, CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE; categorical clustering algorithms , STIRR, ROCK,CACTUS.

Other DM techniques and Web Mining:

Application of Neural Network, AI, Fuzzy Logic and Generic algorithm. Decision tree in DM. Web Mining. Web content mining ,Web structure Mining. Web usage Mining. Temporal and Spatial DM: Temporal association rules, Sequence mining, GSP, SPADE, SPIRIT, and WUM algorithms, Episode Discovery, Event prediction, Time series analysis. Spatial Mining ,Spatial Mining tasks. Spatial clustering , Spatial Trends. Data Mining of Image and Video: A Case study.

Image and Video representation techniques, feature extraction, motion analysis, content based image and video retrieval, clustering and association paradigm, knowledge discovery.

WIRELESS & MOBILE COMPUTING

Introduction to wireless, cellular, Digital , PCs mobile radio, speech coding for wireless system and application PCM, DPCM, DM, Vocoder & linear Predictive coding. Performance comparison. Media access control, Telecom system satellite system, broadcast system. Wireless LAN: IEEE802-11 Hiper LAN, Bluetooth, Adhoc Network: Characteristics , performance issue , routing in mobile host. Network Issues: Mobile IP, DHCP< mobile transport layer, Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, selective transmission, transaction oriented TCP.

Application Issue: Wireless Application control Dynamic DNS , File system synchronization protocol, context aware application security, analysis of existing wireless network.

PATTERN RECOGNITION

Introduction to pattern recognition, types of images, regular pattern, irregular pattern, fuzzy methods. Statistical pattern recognition feature selection, syntactic pattern recognition, Clustering and non supervised learning methods. Combine detection method, edge detection, edge linking, gradient, laplacian, line

detection, motion based , point detection snake method. Boundary description, detection, matching, merging, segmentation, smoothing, splitting of boundaries syntactic, analysis of region boundaries, study of shape by region analysis.

Explanation of how fuzzy approach can be applied to pattern recognition, classscificatory analysis preprocessing, feature detection and primitive extraction, adaptive classification of fuzzy grammar.Algorithms of pattern recognition, neural network fundamentals, approach for pattern recognition.

HUMAN COMPUTER INTERACTION

Interaction between computation and the physical world. Input and output devices in their various forms – devices susch as keyboards and printer, robotic sensors and effectors. Interaction between computation and biological world – Sensor for biological substances and process and effectors that can intervene in them. Interaction between computation and people – traditional discipline of human computer interaction, authorization process that entitle people to access computational resources. Computer to Computer Interaction – Networking, Parallel / Distributed Computing/ Grid

INFORMATION ARCHITECTURE & SECURITY

Principles of Information Security, Security Threats, risks, physical security of computer, hardware security. 2. Data preservation : Information Systems analysis for security of database system and techniques of access control. 3. Software security: encryption, decryption, basic cryptography, firewalls, digital certificates, digital signatures, security algorithms like RSA,DSA,DES etc. 4. Security in E-Commerce application: Web server security, security in computer networks and distributed systems, security protocols, virtual private networks, security in mailing systems. Shareware.

ADAPTIVE COMPUTING

Introduction to adaptive computing & adaptive Software like ubiquitous computing, autonomic computing. Different approaches to implementing software adaptation, parameter adaptation, composition adaptation. Middleware & Adaptation, Layer decomposing for middleware. Computational reflection, component based designing. Meta object protocol. Middleware & other factors. Composing : types, Static & Dynamic. Key challenges : Assurance Security, Interpretability, Decision Making.

BARKATULLAH UNIVERSITY, BHOPAL

SYLLABUS FOR Ph.D ENTRANCE TEST
SUBJECT - INFORMATION TECHNOLOGY

Max. Marks : 100

Note : There will be 100 objective type of questions minimum passing marks will be 40. No negative marking.

DISTRIBUTED COMPUTING –

Introduction to the distributed systems, Pros and Cons of distributed Processing, distributed databases, distributed Resources, distributed Networks management. Design Considerations; Communication line loading , Partitioning and Allocation, Network Data Base design Consideration .data Communications distributed

Networks-Uylessd, Black. Fundamental of Network and distributed Operating System, Remote Service Robustness Design issues, distributed file system , Naming and Transparency, Remote file Access, File replication , Distributed coordination ; Event ordering, Mutual exclusion , Atomicity , concurrency control, Deadlock handling, various algorithms. Distributed shared Memory ; Architecture, Design & Implementation issues, Granularity, structure, replacement strategy , Thrashing synchronization : clock synchronization, Event Ordering, Mutual Exclusion Process Management: Process Migration Threads. Case studies: Amoeba, V-System , Mach, Chorus.

COMPUTATIONAL MATHEMATICS

Real Analysis : Functional of several variables, continuity; partial derivatives; Taylor's Derivatives, the operators div, curl, grad; Jacobians, Jacobian theorems; double, triple, line and surface integral; theorems of Gauss and Stokes: applications. Algebra: n-Dvectors, vector spaces, linear dependence . Determinants and matrics of order n-Rank, eigen values, quadric forms, applications. Basic MATLAB function and applications. Fuzy Set Theory and application to communication problems. MATLAB tools for wavelet transform. Propositional logic.predicate logic,conjuction,Disjunction,Tautology.

OBJECT ORIENTED MODELING & DESIGN

Overview of Object Oriented concepts :

Need for Object Oriented Programming, characterization of Object oriented languages Object Oriented Design : Objects structure concepts, methodology for object oriented

design(Booch,& chen & chen) ,Design modelling, system design life cycle Object oriented programming : an overview of C++ programming ,loops and decisions,structures and functions, objects and classes , array and pointers, Inheritance , virtual functions files and stream

Object oriented data bases :relational V\s object oriented dat bases .the architecture of OO databases ,query languages for OO databases ,Gemstone\O2\orion

Distributed Object Oriented Systems : object management group, CORDA

NETWORK SECURITY AND CRYPTOGRAPHY

Basic concepts: Information Systems reviewed; Batch Systems ; On-line Systems ;Wide Area Networks(WAN), Metropolitan Area Networks(MAN),Local Area Networks (LANs: applications types)

Security defined ; Roles. Models: Characteristics of security models , Reference monitor concept, Formal Security Models – Harrison- Piazzo model, Ulman Model, Bell La-Fadila Model, Object-oriented Model, Clares Willson, Chines Wall Model,etc. Information Flow , Role based access control. Covert channels, Security mechanisms in Operating Systems.

Policy Paradigm: Meta policies. Implementing a security model , formal specifications and verification methodologies. Targets; Facility , Hardware , Software ,Applications, Data Communications, Procedures(Administrative), Personnel. Threats to Security: Areas of vulnerability, Physical Security, Data Security, Systems Security, Computer System Security, Communication Security, Personnel Security Threat Perpetration: Sources. Manmade, accidental. Threat prevention measures. Identity verification , Cryptography. Disaster recovery and Contingency Plan , Security Management , The future of Computer Security.

ADVANCED COMPUTER ARCHITECTURE-

Flynn's & Handler's Classification of parallel computing structures.Pipelined & Vector Processors. Data & control hazards and method to resolve them. SIMD multiprocessor structures. Interconnection networks. Parallel algoritms for array processors. Search algorithms, MIMD multiprocessor Systems, Scheduling and load balancing in multiprocessor systems, Multiprocesing control and algorithms.

NEURAL NETWORK

Ann Definition, Taxonaomy of neural net classifiers for fixed patterns, Mc-Culloch & Pitts Model, structure and working of human brain & comparison with basic ANN model, single layer network. Perceptron training algorithm, linear separability, Hebb's learning rule, widrow & Holf's learning rule / Delta rule, ADALINE, MADALINE, Comparison of ANN with human brain and AI characteristics and application of ANN. Multilayer perception, problem with linear activation function, different activation functions like sigmoidal/squashing function, linear threshold function, hyperbolic tangent and Guassian function. Rumelbart's error back propogation algorithm (EBPA) with proof, momentum, limitations, characteristics and Application of EBPA, case study : NETTALK, two dimensional pattern recognition etc. Fast training of MLP : EBP using direct solution methods (EBPVDS) , DR symmetric Guassian Elimination Method (DRSGE) , Random MBD (Minimum Bit distance) Gram- Schmidt methods (RMGS), case study: Function approximations, Pattern recognition and vowel recognition. Counter Propagation Network: Network Structure, functioning in Normal & Training mode, characteristics of CPN. Deterministic v/s statistical training, Boltzman training, Cauchy training, Artificial specification methods. Hopfield /recurrent network, configuration, stability constraints, Associative memory characteristics, limitations and applications Hopfield v/s boltzman machine. Competitive learning : concepts, weight change, example 7 characteristics, lateral inhibition : concepts & examples.

Kohonen self-organizing feature map resemblance with human brain, feature map algorithm-how alpha and d changes with time, examples and properties. Adaptive Barkatullah University Institute of Technology, B.U., Bhopal

Resonance Theory(ART): Architecture, classification, implementation & training.

Optical neural network, Cognitron and Neocognitron.

ADVANCED SOFTWARE ENGINEERING-

Introduction ,Software life –cycle models, software requirements specification, formal requirement, specification-axiomatic and algebraic specification, Function –oriented software design ,object oriented design, UML, coding and unit testing, data design architectural styles & pattern architectural design ,assessment of

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Engg.. Formal Methods ,clean room software Engg, component based development, software re engg,

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ADVANCED DBMS

Overview of Database Management, Conceptual Database Design, Logical Database Design, Physical Database Design, Query Processing, Transaction processing, Crash recovery, Concurrency control, , Distributed Database, client/server database. Integrity security and repositories. Emerging Database trends, Design and database administration skills based on near-real life applications.

COMPUTER GRAPHICS AND ANIMATION

Transformation and Projections. Bresenham's line drawing algorithm, Homogenous coordinate system(2D & 3D), transformation matrices for translation, scaling, rotation,shear rotation about an arbitrary axis(3D), parallel projection, perspective projection, clipping, Sutherland cohen algorithm, cyrusbeck algorithm curves & surfaces, Development of Bresenham's algorithm to draw octant of a circle, Bezier curves, Bspline curves, solid modeling, Hidden surface removal, shading, introduction to multimedia, Non Temporal media, Audio, Video, Graphics animation..

PARALLEL COMPUTING

Parallel processing, Parallel computer structure, designing of parallel algorithms, analyzing algorithms, general principles of parallel computing, Parallel sorting algorithms, Batcher's bitonic sort. Bitonic sort using the perfect shuffle, parallel bubble sort, odd-even transport sort, Tree sort, quick sort, sorting on the CRCW, CRFW, EREW models, searching a sorted sequence, CREW,CRCW,&EREW searching, searching on a random sequence EREW,ERCW,CREW & CRCW searching on the tree, mesh .a network for merging ,merging on the CRFW,ERFW models, computing Fourier Transforms, Computing the DFT in parallel, a parallel FFT algorithm .

COMPUTER AIDED SIMULATION & MODELING.

System & models: The concept of a system, system environment, stochastic activities, continuous and discreet system, system modeling, type of models, stastic physical models, dynamic physical models, stastic mathematical models, dynamic, mathematical models,

principals used in muddling, simulation of a pare persuit problem simulation of an inventory problem.

Simulation of continuous system:-

Continuous system models, differential equations, analog computers, analog methods, hybrid computers, digital analog simulations continuous system simulation languages, CSMP III hybrid simulation, feedback system, simulation of an interactive system, real time simulation.

Discrete system simulation:-

Probability concepts in simulation, random number generations and their testing

stochastic variable generation, fixed time - step vs. event-to event model.

Simulation of queuing systems :

Arrival pattern, poisson arrival pattern, the exponential distribution, the hyperexponential distribution, service times, simulation of a single-server queue, the normal distribution, measures of queues.

GEOGRAPHICAL INFORMATION SYSTEMS

Principle of GIS, Data Acquisition, Spatial Data Bases, data structures and algorithms for GIS, spatial data, manipulation and analysis, query processor, visualization ,spatial decision support system, use of a typical GIS package. GIS system architecture, GIS design and implementation, application

EMBEDDED SYSTEM-

Hardware fundamentals:-Gates, timing diagram, memory, microprocessor, buses, DMA. Interrupts:- Microprocessor architecture, interrupts basics, Interrupt latency, shared data problem. System partitioning, building the architectural model, Input and output processing, Hardware and software portioning, timing requirement. Microprocessor selection, Microprocessor versus micro-control analysis CISC versus RISC study of major embedded Microprocessor architecture memory system design . system optimization architecture for embedded software:- round robin, found robin with interrupts. Function-queuescheduling and real time operating system. Real time operating system:- tasks and task states. Task and data. Semaphores and shared data operating system service:- inter task communication . timer service. Memeory management . events and interaction between interrupt routines and real time operating system . software selection issues. Selection an RTOS. RTOS performance

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Basics of Electronics commerce, Characteristics of Electronics products, Digital cash and payment systems, Financial Services, Information Markets, Product choices, Internet, Infrastructure and pricing, Intranets, Firewalls Security Issues, Authentication and non repudiation of transactions, Distributed Application Architecture for Electronics commerce. Customer front end design production and supply- chain work flow in e-commerce. Concepts & Principles of e-governance issues, features and security in e-governance.

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code. and Walsh's code. ISDN & Value added communication system simulation & Analysis using MATLAB .

SOFTWARE PROJECT MANAGEMENT –

Managing software projects Software product, process and project management CMM, KPAs .For project management, software process Improvement, resources management,team work and structure, training, project metric, documentation, project management. For conventional and object oriented software projects, software project, knowledgebased management

Project planning Project planning infrastructure, process planning feasibility analysis cost and efforts estimation, models and technique, risk analysis and RAMM plan, project scheduling and tracking plan .SQA and quality planning ,SCM activities and plan , project management plan.

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Project management for special classes of software project - Using CASE tools, CASE,re-engineering ,reverse ,forward engineering Client/server software engineering , web engineering , outsourcing , software project management standards

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Introduction:

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CLARA, CLARANS; Hierarchical clustering, DBSCAN, BIRCH, CURE;

categorical clustering algorithms , STIRR, ROCK,CACTUS..Other DM techniques and Web Mining: Application of Neural Network, AI, Fuzzy Logic and Generic algorithm. Decision tree in DM. Web Mining. Web content mining ,Web structure Mining. Web usage Mining. .Temporal and Spatial DM:Temporal association rules, Sequence mining, GSP, SPADE, SPIRIT, and WUM algorithms, Episode Discovery, Event prediction, Time series analysis. Spatial Mining ,Spatial Mining tasks. Spatial clustering , Spatial Trends. Data Mining of

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Introduction to wireless, cellular, Digital , PCs mobile radio, speech coding for wireless system and application PCM, DPCM, DM, Vocoder & linear Predictive coding. Performance comparison. Media access control, Telecom system satellite system, broadcast system. Wireless LAN: IEEE802-11 Hiper LAN, Bluetooth, Adhoc Network: Characteristics ,performance issue , routing in mobile host. Network Issues: Mobile IP, DHCP< mobile transport layer, Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, selective transmission, transaction oriented TCP. Application Issue: Wireless Application control Dynamic DNS , File system synchronization protocol, context aware application security, analysis of existing wireless network.

Computer Networks and Web Technology-

Introduction, history and development of computer networks, networks topologies.

Physical Layer: theoretical basis, transmission media, analog transmission, digital transmission, switching.

MAC layer: Aloha protocols, local area networks -- Ethernet, token ring, FDDI. Data link layer: sliding window protocols. Network layer: routing algorithms, congestion control algorithms, internetwroking -- bridges and routers. Transport layer. Session, resentation, and application Layers. Use of TCP/IP protocol suite as running example.

Introduction to X.25, ISO protocols. Today the Internet is being used for myriad of applications - electronic publishing, electronic commerce, distance education, collaborative working, etc. This course intends to investigate the underlying principles and practices that support these applications. Introduction to computer networks; Content preparation - HTML, DHTML, VRML, SGML, XML and other markup schemes; Images - compression, formats; Audio - compression, formats; Content Delivery - protocols - HTTP and variants, Internet servers, proxy servers; Search engines; Data on the web; Content Display - browsers, plugins, helper applications; Interactivity -Java, Active-X; Component technologies, Javabeans, CORBA; Security, Electronic payment

systems, Firewalls, Encryption, Watermarks; Performance, Benchmarking the Web.

Software Architecture & Design

Course Contents:

Complex software systems require abstraction and analysis at an architectural level of abstraction. In this course we study, typical software system structures (architectural styles), techniques for designing and implementing these structures, models for characterizing and reasoning about architectures, and tools architectural modelling. Role of architecture in Software engineering; Enterprise Architectures, Zachman's Framework; Architectural Styles, Design Patterns; Architecture Description Languages; Product-line architectures; Component based development

E-GOVERNANCE

Basic of Electronic Governance, Characteristics of Electronic Products, Digital

Cash and Payment Systems. Financial Services, Information Markets, Product Choices. Internet Infrastructure and pricing. Intranets, Firewalls Security Issues. Authentication and non-repudiation of transactions. Distributed Application Architecture for Electric Commerce. Customer Front-end Design. Production and Supply-chain work flow in e-commerce.

IPR & Cyber Laws:

Intellectual Property:- WIPO (World intellectual Property Organization), International Tread related aspects Intellectual Property Rights Agreement, Intellectual Property right related to – literary, artistic, scientific & industrial design rights. Commercial & industrial Design rights

Information as Property Cyber Laws :- cyber laws in India, patent laws, Laws of Com: E-bussiness, IP, IT & piracy laws, internal laws, IT act2000, Laws of Indian cyber space. The Menace Of cyber crimes, Cyber Hacking,

UNIX INTERVALS AND SHELL PROGRAMMING

Introduction to the kernel: Architecture of the Unix, the buffer cache. Internal

representation of files:-inode, accessing blocks, releasing blocks, structure of regular files, conversion of a path name to an inode, inode assignment to a new file, allocation of disk-block. System calls for the file systems: OPEN, READ,WRITE,CLOSE,PIPES : the pipe system call, opening a named pipes, reading and writing pipes,closing pipes DUP,Mounting and Un-Mounting file system,LINK, UNLINK. System call for TIME and CLOCK.

The structure of processes : process states and transitions, layout of system emory, the context of a process, saving the context of the process,manipulation of the rocess address space. Process Control : process creation, signals,process termination, awaiting process

termination, the user-id of a process, changing the size of the process, the system BOOT and INIT process.

Shell Programming : Study of different types of Shell like C shell, Bourne Shell etc. Shellvariable, Shell script, Shell Command. Looping and Making choices: For Loop,While and Until, Passing arguments to scripts. Programming in different shells. Barkatullah University Institute of Technology, B.U., Bhopal Inter Process Communication: Process Tracing, Network communicationSockets Multiprocessor System : Problem of multiprocessor systems,Solution with Master and slave Processor, Solution with semaphores. Study of distributed Unix System.

HUMAN COMPUTER INTERACTION

Interaction between computation and the physical world. Input and output devices in their various forms – devices susch as keyboards and printer, robotic sensors and effectors. Interaction between computation and biological world – Sensor for biological substances and process and effectors that can intervene in them. Interaction between computation and people – traditional discipline of human computer interaction, authorization process that entitle people to access computational resources. Computer to Computer Interaction – Networking, Parallel / Distributed Computing/ Grid Computing / Utility Computing.

ADAPTIVE COMPUTING –

Introduction to adaptive computing & adaptive Software like ubiquitous computing, autonomic computing. Different approaches to implementing software adaptation, parameter adaptation, composition adaptation. Middleware & Adaptation, Layer decomposing for middleware. Computational reflection, component based designing. Meta object protocol. Middleware & other factors.

Composing: types, Static & Dynamic. Key challenges: Assurance Security, Interpretability, Decision Making.

BARKATULLAH UNIVERSITY, BHOPAL
SYLLABUS FOR Ph.D ENTRANCE TEST
SUBJECT – MECHANICAL ENGINEERING

Max. Marks : 100

Note: There will be 100 objective type of questions minimum passing marks will be 40. No negative marking.

1. **Linear Algebra, Differential equations**: First order equations, higher order linear differential equations Initial and boundary value problems, Laplace transforms.

2. **Probability and Statistics**: Definitions of probability and sampling theorems. Mean, median, mode and standard deviation, Random variables.

3. **Numerical Methods**: Numerical solutions of linear and non-linear algebraic equations Integration by trapezoidal and Simpsons rule, single and multi-step methods for differential equations.

4. **Strength of Materials:** Stress and strain, stress-strain relationship and elastic constants, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts, thermal stresses.

5. **Design:** Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram;

Principles of the design of machine elements -such as bolted, riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

6. **Thermodynamics and its applications:** Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle. Irreversibility and availability; behavior of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles.

7. **Power Engineering:** Steam Tables, Rankine, Brayton cycles with regeneration and reheat;

I.C. Engines: Air-standard cycles, normal & abnormal combustion in S.I. and C.I. engines, engine performance, alternative fuels for I.C. engines, Homogeneous charge compression ignition (HCCI) engine;

Refrigeration and air-conditioning: Refrigeration system, expansion devices, condensers and evaporators, psychometric, un-Conventional refrigeration and air Conditioning systems and new Trends in the field.

8. **Modern Energy Sources**: Solar, wind, geothermal, nuclear and biomass energy.

9. **Fluid Mechanics:** Fluid properties; fluid statics, manometry, buoyancy; control-volume analysis of mass, momentum and energy; fluid acceleration; Bernoullis equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes.

10. **Heat-Transfer:** Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins;

dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

11. Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels; bearings; governors; static & dynamic balancing of rotors.

12. Engineering Materials: Basic concept of structure of solids, crystalline materials, defects in crystalline materials, alloys and binary phase diagrams, structure and properties of engineering materials, characterization of engineering materials, stress-strain diagrams, mechanical behavior of materials, heat-treatment and surface treatment, polymers & polymer composites, plastics, ceramics, composites & nanomaterials.

13. Production Engineering: *Machining:* Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and tool wear; economics of machining; *Powder Metallurgy*;

Metal Forming: basic principal of forging, drawing and extrusion;

Metal Casting; die casting, investment casting, centrifugal casting, gating & riser design, melting furnaces;

Fabrication Processes; weldabilty, metallurgy of welding, principal of gas, arc and resistance welding,

Principles of non-traditional machining processes,

Principles of work holding, principles of design of jigs and fixtures.

14. Computer Integrated Manufacturing: Concepts of CAD/CAM, geometric transformations, product design, CIM.

15. Production Planning and Control: Forecasting models, aggregate production, production planning and control, scheduling, materials requirement planning.

16. Optimization Techniques: Linear programming, simplex method, transportation, assignment, simple queuing models, PERT and CPM.

BARKATULLAH UNIVERSITY, BHOPAL
SYLLABUS FOR Ph.D ENTRANCE TEST
SUBJECT – APPLIED PHYSICS

Max. Marks : 100

Note: There will be 100 objective type of questions minimum passing marks will be 40. No negative marking.

Mathematical Physics:

Matrices; Inverse, Orthogonal and unitary matrices; independent elements of a matrix; Eigenvalues and eigenvectors; Diagnolization; Complete orthonormal sets of functions. Caley-Hamilton theorem. Basic idea about Legendre, Bessel, Hermite, and Laguerre equations. Fourier series, FS of arbitrary period; Half wave expansions, Fourier integral and transforms.

Solid state Physics:

Density of states, K-space, Bloch wave, Bloch theorem, Kronig-Penny model, origin of energy gap , Brillion zones, Number of possible wave functions per band, velocity of electrons according to periodic potential , Influence of electric field, effective mass ,concept of hole, acceleration of electron moving in periodic lattice, Hall effect, Fermi Dirac distribution function. Meissner effect-Flux quantization, persistent current, phenomenological theory, London equation, Type I and type II superconductors, cooper pairs, BCS theory,

Quantum Mechanics:

Uncertainity principle, Energy and momentum operators, Schodinger wave equations, Analysis of particle in a box, linear harmonic oscillator, hydrogem atom. WKB method, validity & connection formula, application to alpha-decay. Time dependent perturbation method, harmonic perturbation and transition probabilities, absorption and emission of radiation

Electronics:

Essentials of transistor biasing circuits, various methods of transistor biasing, Classification of amplifiers, distortion in amplifiers, frequency response, R .C. coupled amplifier, transformer coupled amplifier, Criteria for Oscillation, phase shift, Wein bridge, Hartley & Colpitt oscillator. Frequency stability; Astable, Monostable and Bistable multibrators, Schmitt trigger. Operational amplifier and its application e.g. summation, subtraction, integration and differentiation, wave form generation, comparators, & voltage regulator, FET, MOSFET, UJT, SCR, tunnel diode and Zener Diode.

Electrodynamics:

Maxwell's equations, boundary conditions, electromagnetic waves and their propagation, reflection and transmission of electromagnetic waves, parallel plate waveguide, rectangular waveguide and cylindrical waveguides, dipoles. Plasma oscillations, Debye shielding, Plasma parameters.

Digital electronics:

Number systems and codes.:- Binary, Octal, Hexadecimal, floating point number system and their conversion method BCD code, excess three code, ASCII code. Logic gates, De Morgan's theorems, Multiplexer, demultiplexer, signed and unsigned numbers, 1's and 2's compliments, half adder, full adder 2's compliment adder and substractor, Combinatinal logic, minimizatioin technique using karnugh's map, SOP and POS forms.Counters :- Synchronous, asynchronous counters, ring counter, programmable and presettable, up/down counter, Johnson counter/ twisted counter. Designing counters using flip flops.Memories :- ROM, RAM, EPROM, EEPROM, PAL, PAL Programming static and dynamic RAMs, charged coupled device.

Lasers and fiber optics:

The Einstein coefficients, derivation of the condition for population inversion. Line broadening mechanisms. Mode locking and Q switching. Ruby laser, Nd-YAG laser, Carbon di oxide laser, He-Ne laser, semiconductor laser, excimer laser. Numerical aperture, V-number, Types of

fibers: SM, MM, and GI fibers, Pulse dispersion in optical fibers. Various losses in optical fibers. Dispersion shifted and dispersion compensating fibers, optical sources: LED, laser diodes and detectors: Photo diode and Avalanche photo diode for optical communication systems.

Applied electronics:

Amplitude modulation; Generation of AM modulated waves- DSBSC modulation. Generation of DSBSC waves, Coherent detection of DSBSC waves, SSB modulation, , Generation and detection of SSB waves. Vestigial side band modulation. Angle modulation:- FM, phase Modulation, Noise in FM system, Noise triangle, Pre-emphasis and de-emphasis, Generation of FM, direct methods, indirect method. Pulse modulation; Pulse width modulation, pulse position modulation, pulse code modulation.

Basic idea about Klystrons, Magnetrons and Travelling wave tubes, velocity modulation two cavity Klystrons and Reflex Klystrons, Tunnel diode, Gunn effect, IMPATT diode, TRAPATT diode. Optoelectronics device: Photovoltaic effect, Solar cell.

BARKATULLAH UNIVERSITY, BHOPAL
SYLLABUS FOR Ph.D ENTRANCE TEST
SUBJECT – APPLIED CHEMISTRY

Max. Marks : 100

Note : There will be 100 objective type of questions minimum passing marks will be 40. No negative marking.

PHYSICAL CHEMISTRY

Basic principles and applications of Thermodynamics and thermodynamic equilibrium, Vant-Hoft isochore, fundamental equations of thermodynamics. Basics of atomic structure, electronic configuration, shapes of orbital s, hydrogen atom spectra. Theoretical treatment of atomic structures and chemical bonding. Chemical thermodynamics. Phase equilibria. Electrochemistry Nernst equation, electrode kinetics, electrical double layer, Debye-Hückel theory. Chemical kinetics – empirical rate laws, Arrhenius equation, theories of reaction rates. Concepts of catalysis. Preparation and properties of colloids. Donnan membrane equilibrium Freundlich Langnuir and B.E.T. adsorption isotherms. Adsorption from solution of solute on solids. Consequences of light absorption, photo-chemical kinetics Stark-Einstein law of photo chemical equivalence quantum yield of & photo-chemical reaction. Chemical applications of group theory.

INORGANIC CHEMISTRY

Chemical periodicity. Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules. Concepts of acids and bases. Chemistry of the main group elements and their compounds. Allotropy, synthesis, bonding and structure. Chemistry of transition elements and coordination compounds – bonding theories, spectral and magnetic properties, reaction mechanisms. Inner transition elements – spectral and magnetic properties, analytical applications. Cages and metal clusters. Chemistry and mechanism of corrosion, Zero potential electrode, types of Corrosion cells, free energy relationships ,chemistry and mechanism of corrosion. Theories &mechanism of inhibition & passivity, Cathodic protection and anodic protection Analytical chemistry- Thermo gravimetric analysis, Optical Methods, Polorograpy, Chromatography, Conductometry, Spectroscopy, Industrial aspects of glass , Inorganic acids HCl H_2SO_4 HNO_3 H_3PO_4 ,Water, cement, sugar petrochemical, ceramics inorganic chemical process. Manufacture of Ammonia, Urea, Super Phosphate, Fertilizer and its Major Engineering problems.

ORGANIC CHEMISTRY

Formations and stabilities of carbonium ions, carbanions, carbenes ,nitrenes, radicals and arynes, Reactive intermediates, Nucleophilic, Electrophilic, Radical substitution, Addition and Elimination reactions. Barton, Baeyer-villigier, Birch, Chichibabin, Clemmensen Diels-alder, Friedel crafts, Hoffmann,Hofmann-Loffler-Freytag, Hydroboration, Lossen, Mannich, Michael addition,Meerwein- Ponndorf-Verley, Perkin, Grignard, Reimer-Tiemann, Reformatsky, Storkenamine, Organometallic compounds - synthesis, bonding and structure, and reactivity. Organometallics in homogenous catalysis. Wittig, Wolff-Kishner. Oppenaur oxidations, Robinson annulations, Routine functional group transformations and inter- conversions of simple functionalities, Aldol, Clasien, Stobbe and Dieckmann, Schmidt, Condensations, Beckmann and Fries, Favorski, Curtius Rearrangements. Stereochemistry and Conformational Analysis: Concept of chirality, Asymmetric synthesis (including enzymatic and catalytic nexus) enantio and diastereo-selective synthesis, racemization, resolution, Walden inversion. Effects of conformation on reactivity in acyclic compounds and cyclohexanes, Conformational analysis of cyclohexane. Pericyclic Reactions: Selection rules and stereochemistry of electrocyclic reactions,cycloaddition and sigmatropic shifts, sommelet, Hauser and Cope rearrangements. Mechanisms of polymerization, Tacticity of polymers Glass transitiontemperature, counditive polymers, Technological importance of plastics. Rubbers & vulcanization, Genera methods of determining structure of an alkaloid, Chemistry of cholesterol Stigamosterol, & Bile acid. Metabolism of Lipid, Amino Acid and Proteins . Introduction & Mechanism of action of Drugs.Nomenclature, classification. Synthesis,mode of action and therapeutic Uses of Following Penicillin, Streptomycin,Chloromycetin, tetracyclm, Ampicilin,Ciprofloxacm. Sulpha acetamide, Sulphadiazine, Sulphagnanidine,Sulphameracine, Sulphadimidin, Sulphathiazole, Sulphamethoxazole,Sulphadoxing, and other Sulphadrugs- 4 amino & 8 amino quinoline derivatives Bological function vitamins ,Kinetics and mechanism of chemical processes, classification of reactions. Kinetics,Mechanism, Thermodynamics, Techniques and Process equipments of Nitration, Sulphonation, Halogenations, Production of DDT, BHC, Gammaxene, Adrian, Malathion, Parathion. Principles and basic laws. Instrumentation and technique of analysis UV, IR, NMR, EPR, MS, Mossbauer, electron spectroscopy and microscopic Techniques.

INTERDISCIPLINARY TOPICS

Chemistry in nanoscience and technology. Green chemistry. Medicinal chemistry. Supramolecular chemistry. Environmental chemistry.

BARKATULLAH UNIVERSITY, BHOPAL
SYLLABUS FOR Ph.D ENTRANCE TEST
SUBJECT – APPLIED MATHEMATICS

Max. Marks : 100

Note : There will be 100 objective type of questions minimum passing marks will be 40.
No negative marking.

Integral Transform:

Laplace Transform and Inverse Laplace Transform, Fourier Transform, Fourier Sine and Cosine Transform, Complex Fourier transform, Inversion formulae, linearity property, Change of scale property and shifting property, Fourier transform of derivatives, Parseval's identity. Application of Laplace and Fourier Transform, Definitions of Hankel transform, Mellin Transform, and their elementary properties.

Fourier Series & Vector Calculus:

Fourier Series: Euler's Formulae, Dirichlet's Conditions, Fourier Series for Continuous and Discontinuous Functions, Half-Range Fourier Series.

Vector Calculus: Gradient, Divergence & Curl, Vector Differentiation, Vector Integration (Line, Surface & Volume), Gauss-Divergence, Stoke's & Green Theorem.

Differential Equations:

Ordinary Differential Equations: Differential Equation of First Order and First Degree , first order and Higher degree , Linear Higher order Differential Equation with Constant Coefficient, Homogeneous Linear Differential Equations, Simultaneous Differential Equations.

Partial Differential Equation: Linear Partial Differential Equation of First Order, Non-Linear Partial Differential Equation of First Order, Homogeneous Linear PDE with Constant Coefficients, Application of Partial Differential Equations. Boundary value problems (wave, Laplace and heat equations).

Numerical Analysis:

Error and Approximations, Solution of Algebraic and Transcendental Equations, Interpolation for equal and unequal intervals, Inverse interpolation. Numerical Integration and Numerical Differentiation, Numerical Solution of Simultaneous linear equations, Solution of ordinary differential equation using Numerical Methods.

Operations Research:

Introduction to Linear Programming, Solution by Graphical and Simplex Method, Concept of Degeneracy and Duality, Optimal Solution of Transportation Problems, Assignment Problems, Job Sequencing Problems.

Functions of Complex Variable:

Complex Function, Continuity, Differentiability, Analytic Function, Cauchy's Integral Theorem, Taylor's and Laurent Series. Residue (Definition), Residue Theorem, Evaluation of Real Integral, Conformal Mapping.

Probability & Statistics:

Probability, Distributions (Binomial, Poisson, Normal), Random variables, Distribution function, Probability density function, Expectation, Moments, Moment generating function, Test of Hypotheses, Level of significance, Small and Large sampling, Chi- Square test. Coefficient of variance, standard error, standard deviation, and correlation and regression analysis. Student t-test, F-test,

Linear Algebra:

Determinants, Matrices, Special Matrices, related matrices, rank of matrices, Eigen Value and Eigen Vector, Caley-Hamilton Theorem. Group, Sub group, co-sets, normal Sub group, Semi group, Ring and Fields, Vector spaces, Vector subspaces, Linear dependence and independence, Bases & Dimension, Linear transformations, The Algebra of linear transformation, Rank of a Linear transformation, Characteristic roots, Relation between characteristic roots and characteristic vectors. Metric Space.

Graph Theory:

Definitions, Sub Graph, Finite and Infinite Graphs, Incidence and Degree, Isolated Vertex, Pendant Vertex, Null Graph, Isomorphism, Sub graphs, Walks, Path and Circuits, Connected & Disconnected Graph, Components, Euler Graph, Operation of Graphs, Hamiltonian Path and Circuit. Tree, Decision, Rooted, Binary, Spanning Trees, Properties of trees.

Special functions :

Legendre and Bessel functions, Hyper geometric function, Legendre polynomial, Properties of Bessel functions, Simple transformations, Rodrigue's formula,

DOCTOR OF PHILOSOPHY

(Ph. D. in Technical Education)

Affiliated to

BARKATULLAH UNIVERSITY
Bhopal – 462 026
(Madhya Pradesh), India

CURRICULUM
FOR
Ph.D ENTRANCE EXAMINATION

National Institute of Technical Teachers' Training & Research
Shamla Hills, Bhopal – 462 002
(Madhya Pradesh), India

DOCTOR OF PHILOSOPHY

(Ph.D. in Technical Education)

(UNDER FACULTY OF TECHNICAL EDUCATION)

MAY, 2012

National Institute of Technical Teachers' Training & Research
Shamla Hills, Bhopal – 462 002
(Madhya Pradesh), India

CONTENTS

1. Rationale:

The teachers in technical institutions are required to keep abreast with latest technologies and development in the area to help their students acquire requisite knowledge and skills and more importantly inculcation of desirable attitudes and values, professional ethics contributing towards the development of professionalism among the prospective engineers and technicians.

To satisfy the growing need of competent educational manager, National Institute of Technical Teachers' Training & Research, Bhopal (India) has launched a unique Post-graduate full-time program "Master of technical Education" (M. Tech. Ed.) A number of students from India and abroad have undergone this program and occupy very important positions as Principals, Educational Administrators and Managers in their respective state systems.

There is strong need to undertake research initiatives to break new grounds, to assess the impact of the innovations tried out in the past years, to enhance the quality of technical education and find solutions to various problems affecting the whole gamut of technical education system. Research in technical education has to address the needs of the modern industrial world, community and march towards self-reliance. Conducting Research in technical education can be an enlightening process to realize just how much we are able to discover through the application of rigorous and appropriate research methods.

In view of all this, a research program at a Doctorate level leading to Ph. D. Degree in Technical Education has been conceived, designed, developed and offered by N.I.T.T.T.R. Bhopal to develop competent professionals with problem solving attitude, critical thinking and effective decision-making skills based on objective data. This program is offered under the Faculty of Technical Education of Barkatullah University, Bhopal (India). The program has been designed adopting inter-disciplinary approach integrating the contents of engineering degree / diploma courses with various pedagogical aspects of technical education system such as curriculum development, implementation of curriculum using variety of methods and media, students assessment, Information and communication technology, consolidating the effect of various innovations experimented in the system, technology forecasting, status of demand and supply of technically trained manpower in the country.

2. About NITTTR Bhopal

National Institute of Technical Teachers' Training & Research (NITTTR) Bhopal is a premier national institute established in 1966, by the Government of India under the Ministry of Human Resources Development for the improvement of the quality of technical education systems. The institute holds expertise in the various areas of technical education like curriculum development, educational management, policy formulation, continuing education, student assessment, multi-media development, human resource development, community networking, industrial liaison, designing learning resources and education research it offers Ph.D, PG Programms as well. It is a resource centre dedicated for the improvement of the quality of entire gamut of technical education system including engineering colleges, management institutions, polytechnics, vocational education system and other professional institutions. The institute along with its extension centres at Ahmedabad, Pune, Alto-Povorim–Goa and Raipur has an excellent working synergic partnership with industries and field agencies besides several technical institutions of repute at the national and international level, and as a consequence has enhanced its capabilities in providing a variety of yeoman services under one umbrella.

NITTTR Bhopal is internationally recognised for its HRD services and its innovative approaches in developing professionally competent manpower.

3. The Research Program Leading to Ph. D. Degree (under Faculty of Technical Education, B.U. BHOPAL)

3.1 Aims of the Doctoral Program:

A Doctoral degree awardee of NITTTR, Bhopal should have demonstrated the capacity to:

- Design and implement at a high level of originality and quality, either in original research project(s), of significant to technical education discipline or cross disciplinary field(s) or projects addressing an important problem or question concerning policy and / or practice in technical education as profession or its applied aspects in industry: and

- Present, using one or more media, a substantial and intellectually coherent product (s) such as a thesis, dissertation and artifacts or exegesis and portfolio of creative works and / or performance for submission to external examination.

3.2 Thrust Areas For Research In Technical Education:

Normally an aspirant for Ph. D. in technical education may think of the following areas for the selection of topic for his/ her research work:

- Approaches / models for curriculum design and development
- Curricular reforms in technical subjects
- Management and Governance of technical education
- Media design and development
- Innovations in teaching / learning process
- Autonomy and flexibility
- Examination and admission reforms
- Guidance and Counseling
- Entrepreneurship development and self employment
- Manpower planning
- Impact studies / outcome studies for various Innovations
- Tracer studies of pass-outs
- Systemic researches
- ICT and Computer enabled learning
- Feasibility of different modes/ approaches – modular, credit based, distance, online
- Content specific researches

The above list is highly suggestive and may include many more areas relevant to technical education.

4. Course Work for Entrance Examination:

The successful completion of entrance examination will help them in acquiring necessary cognitive skills to enable them to undertake research work, using appropriate statistical tools and research methodology in technical education and allied areas.

The following courses are suggested for the entrance examination leading to admission in Ph. D. program of BU, Bhopal.

Table 4.1 – Course Work

S. No.	Courses	% Weight-age for Entrance Exam
1	Educational Technology	20 %
2	Curriculum Development	15 %
3	Technical Education Research and Statistics	30%
4	Technical Education Management	20%
5	Educational Evaluation	15%

5. Curricula of Proposed Course Work

Name of Course: Educational Technology

Rationale:

Education, the act or process of acquiring and imparting knowledge is crucial to the development of a learner with a view to his participation in the transformation of the world for a better tomorrow. Learning and understanding are the basic to the definition of education. Teaching/ Instruction plays an important role in education. To make the teaching – learning process effective, it is imperative to think of different inputs that may influence this process. Educational Technology is one such input. It covers Technology *in* education as well as Technology *of* education. It is necessitates the inclusion of Educational Technology as a course.

Contents:

Unit 1 - Basic concepts:

Education Technology functions, systems approach and feedback mechanism.

Unit 2 - Basic processes in learning and instruction:

Principles of learning, varieties of learning (intellectual skills, cognitive strategies, information, motor skills, attitudes), events of instruction, conceptual structure and learning hierarchy.

Unit 3 - Instructional objectives:

Educational Aims, Concept of Abilities, competency statement and it's components, , behavioral objectives in different domains Cognitive domain, affective domain, Psychomotor domain and interactive domain. Different taxonomies. (Blooms, Kranthwal and Dave), Rules for formulating objectives. Recent trends in objective writing.

Unit 4 – Communication:

Basic Concepts, models, verbal and non-verbal, written communication, importance of interaction and feedback, barriers of communication. Concept of left brain and right brain function. Application of principles of communication to improve instructional process and for effective professional interaction with peers, superiors and sub ordinates.

Unit 5 - Overview of Instructional Strategies:

Inductive and deductive types, Group Learning, Laboratory based approaches, Workshop based Skill training methods, Field and Industry based methods, Individualized and Self Learning using Computer aided and Computer assisted Learning packages

Unit 6 - An Overview of Instructional Media:

Types of instructional media, characteristics, and selection criteria

Unit 7 - Design and Use of Instructional Resources:

Print Instructional resources, MS-Power Point , principles of media design, 2D and 3D Animations

Unit 8 - Use of ICT:

Information and Communication Technology (ICT) in Teaching Learning Process, Web/ Internet based learning, E-learning, Collaborative learning,

References

i) Romizowski A.J., Designing Instructional Systems, Kogan Page Publishers
ii) Mehra Vandana, Instructional System Design, S.S.Publishers, 1992
iii) Romizowski, A.J., The selection and use of instructional media, Kogan Page, London
iv) Ericson and Curl, Fundamentals of teaching with audiovisual technology, Macmillan Publication Co.
v) Gagne R.M., The conditions of learning, Holt Rinehart and Winston, London
vi) Competency based module on teaching methods - NITTTR Bhopal

Name of Course: Curriculum Development

Rationale:

Curriculum is a key element in the education process, its scope is extremely broad, and it touches virtually everyone who is involved with teaching and learning. The technical education curriculum focuses not only on education process but also on the tangible results of that process. Hence, greater emphasis has to be placed on the development of curriculum that is relevant in terms of the employer, learner and societal needs. Teachers of technical institutions have to appreciate the basic philosophy of curriculum and its developmental procedure. Student assessment and evaluation is an integral part of curriculum. Every teacher therefore requires a thorough understanding of the purposes of evaluation and various instrument and strategies associated with it.

Content:

Unit 1 - Curriculum development:

Concepts, definitions, Characteristics of Curriculum. Curriculum and Syllabus, Curriculum and Instruction, Stakeholders of Curriculum & Roles of Curriculum Professionals. Stages of Curriculum Development : Curriculum Planning, Design, Implementation and Evaluation

Unit 2 - Curriculum Planning:

Systems view of Curriculum Development, Manpower Needs Assessment Conventional techniques such as Job Analysis and Task Analysis.Special techniques such as NGT (Normal Group Technique), Delphi Technique, Search Conference.

Unit 3 - Curriculum Design:

Models of Curriculum Development related to technician education, Programme aims, deriving programme structure from Training Need Analysis (TNA), Determine Curriculum content, Teaching and Assessment Scheme.

Unit 4 - Curriculum Implementation:

Issues and challenges, Factors affecting Curriculum Implementation, Role of teachers in Curriculum Implementation, Approaches/Strategies of Effective Curriculum Implementation, Monitoring of Curriculum Implementation.

Unit 5 - Organizing Learning Experience :

Curriculum Analysis, Design of instructional strategies, Selection of methods and media ,Planning for learning experience ,Assessment of learning experiences.

Unit 6 - Curriculum Evaluation:

Concept and purposes, Models/Approaches to Curriculum Evaluation, Planning for Evaluation, Utilizing results of evaluation for curriculum improvement, Review and revision of curriculum.

References:

i) Stark, J. S., & Lattucs, L. R. Shaping the college curriculum: Academic plans in action. Boston: Allyn & Bacon.

ii) Taba, H. Curriculum development: Theory and practice. New York: Harcourt, Brace & World.

iii) Tyler, R. W. Basic principles of curriculum and instruction. Chicago: University of Chicago Press.

iv) Grouland, NE. Measurement and Evaluation in Teaching, Mac million, N.Y.

v) Harper, Jr A.E. AND Harper, S.E. : Preparing Objective Examinattions- A hand book for teachers, students and examiners, Prentice Hall of India Pvt. Ltd. Delhi.

vi) Popham, J.W. : Modern Educational Measurement: A practice's' perspectives, Printice Hall , New Jersey.

vii) Kubiszyn, T & G Borich: Educational Testing And Measurement Classroom Application and Practice, Harper Collins, College Publications.

Name of Course: Technical Education Research and Statistics

Rationale:

Technical education system has been growing in magnitude and complexity due to rapid changes in society and technology and as a consequence faces a variety of problems. One can no longer cope with this situation by making decisions, solely based on tradition, authority and personal interest. The need to obtain information through systematic and scientific enquiry processes and make decisions based on sound reasoning has been appreciated and realized. This would greatly help objective decision-making leading to more effective solutions to problems.

Further, the technical education a number of in system in India has gone through a number of innovations. Yet there have been little systematic efforts in understanding the processes and outcomes of such innovations. Educational research is invaluable as an instrument for evaluating and strengthening innovations during the different stages of their development. Also, research is highly useful in identifying priority areas, problems and needs requiring innovative efforts.

Analysis of data and interpretation of results requires a researcher to acquire knowledge and skills of appropriate statistical methods. It is in this context that this course on Research methods and statistics in Technical Education is offered. Only those types of research designs which would most commonly be required and the relevant statistical methods will be dealt with in this course.

Content:

Unit 1 - Introduction and Types of Technical Education Research:

Concept of educational research, Areas of research in Technical Education, Types of research-Basic, Applied and Action researches, Qualitative and Quantitative researches

Unit 2 - Steps of conducting education researches:

Problem identification, Research Questions and Objectives of the study, Formulating hypotheses, Literature review –Sources and procedure

Unit 3 - Action Researches in Technical Education:

Action Researches for system's development, Procedure of conducting Action Researches, Implementing the results of Action researches

Unit 4 - Research Designs:

Historical Researches, Descriptive – Survey, Case study, Co relational Researches, Ex-post Facto Researches and Experimental Researches

Unit 5 - Sampling and instrumentation:

Concept of population and sample, Different types of sampling – simple random sampling, stratified random sampling, systematic sampling, area or cluster sampling purposive, Researcher Made Instruments: Questionnaires, Opinionnaire, Interview Schedule and Observation Schedule

Unit 6 - Statistical Applications in Technical Education Research:

Descriptive and Inferential Statistics, Scales of measurement, Frequency Distribution Tables, Graphical representation of data, Measures of central tendency, measures of dispersion, Concept of correlation, Scatter plots, Spearman's rank difference correlation, Pearson's product moment correlation

References:

i) Best J.W. "Research in Education", Prentice Hall of India Pvt. Ltd., New Delhi,
ii) Tuckman, Bruce W. "Conducting Educational Research", New York Harcourt Brace Jovanovich, Inc.,
iii) Eagelhart, M.D., "Methods of Educational Research", Rand McNally and Company, Chicago,
iv) Sax, Gilbert, "Foundations of Educational Research", Prentice Hall inc., New Jercy,
v) Sukhia and Mehrotra, Elements of Educational Research, New Delhi, Allied Publisher.
vi) Moley, George J. The Science of Educatioinal Research, Eurasia Publishing House, New Delhi,
vii) Sharma R.D. "Research Methods in Social Sciences" National Book Organization, New Delhi
viii) Johnson M.C."A review of Research Methods in Education", Rand McNally College Publishing Co., Chicago,
ix) Garret Henry E. "Statistics in Psychology and Education", Gokils Heeafter and Simsons, Pvt.Ltd.,
x) F. Falik B.Brown, "Statistics of Behavioral Science", The Dorskey Press,
xi) P. Blommers and E.F.Lindquist, "Elementary Statistical Methods in sychology and Education", University of London Press Ltd.

Name of Course: Technical Education Management

Rationale

Technical Education System has expanded significantly in the country. It has faced many crisis, challenges and recession in terms of intake, course delivery, employment, financial crisis etc. Now a day's management of the technical institution is not that easy as it used to be in past because of number of reasons. Stakeholders are putting tremendous pressure on the system to produce desired number of educational leaders, who possess skills to vision and prepare strategic plans and implement them to achieve excellence.

Content

Unit – 1 Overview of Education Management:

Management of Technical Education in India, Various management approaches and models followed by sub systems, Role of Technical Education System and Technical Institutions, Systems approach in management

Unit – 2 Influencing skills and Leadership:

Leadership, Motivation, Communication, Peoples Skill

Unit – 3 Teamwork and team building:

Need & Importance, Characteristics, Team Building models, Team effectiveness evaluation

Unit – 4 Problem Solving and Decision Making:

Concept of Problem Solving and Decision Makin, Models of Problem Solving and Decision Making, Conflict Resolution

Unit – 5 Project Management:

Diagnosis of Problem, Concept of Project, Models of project design and planning, Proposal design, Monitoring and evaluation

Unit – 6 Resources Management:

Strategies to Enhance Resources Utilization, Human, Physical, Finance, Information, Time

Unit – 7 Management of Change:

Concept & Models of change, Strategies to implement the change, Resistance to change

Unit – 8 Innovations in Education Management:

Learning Organization, TQM and Accreditation, NBA Norms, Practices of International Engineering Accords like Washington Accords, Sydney Accords etc. Visioning the Future, Re-engineering, Six Sigma

References

i) David N. Griffiths Management in a Quality Environment, Tata McGRAW-HILL Publishing Company Limited, N. Delhi
ii) Gary E Maclean Documenting quality for ISO 9000 and other Industry Standards, Tata McGRAW-HILL Publishing Company Limited, N. Delhi
iii) Arun Shandilya & V.K. Tokhi TQM in Technical Education, Proceedings of National Conference, MACT, Bhopal
iv) Ernest G. Bormann & Nancy D. Bormann Effective Small Group Communication, Burgess Publishing, Edina, Minnesota
v) M.R.R. Nair & T.V. Rao Excellence Through Human Resource Development, Tata McGRAW-HILL Publishing Company Limited, N. Delhi

Name of Course : Educational Evaluation

Rationale

With the growth of cognitive and psychometric theories and the advent of computer in recent years, the technology of test design, data analysis and interpretation has undergone a sea change. Testing and evaluation process cannot be considered in isolation, but it has become an integral part of the teaching and learning process and therefore. Though students' assessment is designed to assist learning, it is noticed that it influences the learning to a great extent and hence quality of learning is greatly influenced by the quality of assessment Quality of assessment is therefore a key issue to be addressed.

The course will be extremely useful to the technical teachers in general. It will be particularly useful to those who would be required to undertake leadership role in the area of educational measurement and evaluation.

Content

Unit – 1 Educational Evaluation-

Conceptual Framework: Measurement, Evaluation, Assessment, Examination, Impact, Tests etc, Measurement and Evaluation- their meanings, concepts and relationship, Types of Educational Evaluation- students evaluation, Programme evaluation, project evaluation, Institute Evaluation

Unit – 2 Student Evaluation:

Basic Purposes Placement/selection, Formative, Diagnostic, Summative, Testing of achievement, aptitude, skill, personality, Comprehensive and Continuous Evaluation: Concept and Purpose, Relationship with Teaching and Learning
Progressive and term work assessment: Purpose and Utility

Unit – 3 Test Characteristics and its estimation

Basic Characteristics-Validity, reliability, objectivity, usability, practicability- their meaning and concepts.

Unit – 4 Evaluation in Cognitive Domain:

Different Types of Items/Questions:
Selected - Response Type Item- True- False, Multiple Choice, Matching, Assertion Reason.
Supply Type Question- Completion Type, Short Answer, Structured Question, Improved essay and Essay type questions.

Unit – 5 Evaluation in psychomotor and Affective Domain:

Assessment of performance and behaviour in laboratory work, project work, and workshop: tools to be used, need and scope, objectives to be assessed, Use of checklists and rating scales in assessing performance and behavior

Unit – 6 Competency Based/Skill Based Assessment

Concept, Issues and Techniques, Models of Competency Based Assessment

References

i) Berk, R. A Criterion Referenced Test, John Kopkins University Press.
ii) Boud, D. Enhancing Learning Through Self-Assessment (London, Sage)
iii) Cole, D. J., Rayon, C.W. and Kick, F. Portfolios Across the Curriculum and Beyond (Thousand Oaks, Crowing Press)
iv) Dreyfus, H.L. and Dreyfus, S.E. 'Mind over Machine: The Power of Human Intuition and Expertise in the Era of the Computer (Oxford, Basil Blackwell).
v) Ebel, R. L. Essentials of Educational Measurement, (New Delhi, Prentice Hall, Inc.)

Barkatullah University, Bhopal

Subject: Pharmacy

Faculty - Technology

Doctoral Entrance Test (DET) syllabus 2012 -13

Total Marks: 100

Unit 1: 20 Marks

All topics will include in Instrumentation methodologies, techniques and applications to structural and quantitative analysis of drug and their methodologies.

Gas chromatography, High pressure liquid chromatography, Ion-Pair Chromatography, HPTLC. Ultra violet, Infra-red (including FTIR), Nuclear Magnetic Resonance (including C-13NMR), Mass spectroscopy, Atomic spectroscopy, Electron microscopy, Radio assaying, Radio immuno assaying and autoradiography.

Unit II: 20 Marks

i. Stability, solubility, pka, dissolution rate, partition coefficient. In vitro and In–Vivo evaluation techniques and product formulation

ii. Designing of Pharmaceuticals:

A. Tablet formulation, Special tablets, preparation of components for compression, characterization of granulation, coating of tablets, Evaluation of tablets

B. Topical and rectal absorption of drugs, formulations and evaluation.

C. Formulation considerations of oral liquids, Suspensions, emulsions, development of various products.

D. Formulation consideration of parenteral, ophthalmic, depot products, Large volume and Small volume parenterals,

E. Environmental control and quality assurance in parenteral drug manufacturing.

iii. Stability in Pharmaceuticals and study of stability kinetics.

iv. Controlled and Novel Drug Delivery Systems: Introduction to Sustained release dosage forms, Prodrug concept, nanoparticles, liposomes, resealed erythrocytes, transdermal and other novel drug delivery systems.

Unit III: 20 Marks

A. BIOTECHNOLOGY:

i. Techniques of enzyme immobilization factor affecting enzyme kinetics and application of immobilized enzyme in different field.

ii. General procedure of Recombination different techniques of Genetic (DNA) Recombination. Application of Recombination DNA technology in different field. Gene cloning and its importance.

iii. Formation and selection of hybrid cell. Production advantages, limitation, characterization, Storage and applications of Monoclonal antibodies.

B. BIOCHEMISTRY:

i. Nomenclature of enzymes, enzyme kinetics and its mechanism of action, mechanism of enzyme inhibition,

ii. Oxidation of fatty acids, Biosynthesis of Fats, Ketosis and Ketogenesis. Metabolism of cholesterol, Control of lipid metabolism.

iii. The respiratory chain, Oxidative phosphorylation, enzymes and co-enzymes involved in oxidation reduction.

C. PHARMACOLOGY:

i. Basic anatomy & physiology of heart, anatomy of blood vessels. Brief introduction of blood circulation. Basic understanding of cardiac cycle, heart sounds. Blood pressure and its regulation. Brief outline of cardiovascular disorders like, hypertension, hypotension, arteriosclerosis, angina, myocardial infarctions,

congestive heart failure and cardiac arrhythmias and different drugs used in above mentioned cardiovascular disease.

ii. Pharmacology of Autonomic nervous system.

(a) Parasympathomimetics and parasympatholytics.

(b) Sympathomimetics and sympatholytics.

(c) Ganglionic stimulant and ganglionic blockers.

iii. Pharmacology of Central nervous system

General Synaptic transmission in CNS, Antiepileptic drugs, Antiparkinsonian drugs.

Unit IV: 20 Marks

i. Quality control of crude drugs. Adulteration of crude drugs and their detection by organoleptic, microscopic, physical, chemical and biological methods of evaluation.

ii. Study of fibers used in pharmacy such as Cotton, Cellulose and their derivatives, Silk, Wool, Nylon, Glass wool, Polyester, Asbestos, Hemp & Jute.

iii. Introduction to methods of preparation of plant extract - Infusion, decoction, digestion, maceration & percolation. Soxhlet extraction and expression.

iv. Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following categories drugs.

A. Alkaloids: Tropane (Belladonna, Hyoscyamus, Datura, Duboisia, Coca and Withania), Quinoline and isoquinoline (chinchona, ipecac, opium) and indole (ergot, rauwolfia, Vinca, nux-vomica and physotigma)

B. Glycosides: Saponins (Glycyrrhiza, Ginseng, Dioscorea, Sarsaparilla and Senega), Cardioactive steroids (Digitalis, Squill,

Strophanthus, Thevatia) and Anthraquinone cathartics (Aloe, Senna, Rhubarb, Cascara and Cochineal).

v. Steroidal drug precursors from plant.

vi. Phytochemical screening: General methods of identification, isolation of plant constituents. Identification and estimation of various functional groups in phytoconstitutents.

vii. W. H.O. guidelines of herbal formulations.

viii. Introduction to Ayurvedic dosage forms. Preparation and standardization of Ayurvedic dosage forms.

Unit V: 20 Marks

i. A study of method of preparation and uses of the following reagent and solution: Nesslers, Fehlings, Molish, Mayer, Barford, Benedict, Dragendorff, Schulzes, Liberman and Burchard, Millon, Wagner, Ammo nium molybdate, Chlorosulphonic acid, Ferric chloride solution.

ii. Nomenclature of organic compounds and stereochemistry: IUPAC system of nomenclature, name based on function, substitute, additive, replacement, conjugative and radiofunctional, concept of Isomerism, optical activity stereoisomerism.

iii. Nucleophilic substitution reactions (SN_1-SN_2), elimination reactions (E_1 & E_2), substitution V/S Elimination.

iv. Physiochemical and physiological properties in relation to biological action: solubility and partition coefficient, selected physico-chemical properties, Ionization, hydrogen bonding, chelation.