M.TECH.(CIVIL ENGINEERING)

Structural analysis: Simple stresses and Strains, shear force and Bending Moment, flexural stresses -Shear Stresses - Deflection of beams - Principle stresses and Strains - Torsion - Columns and Struts -Direct and bending stresses - beams curved in plan - propped cantilever - Continuous beams - Energy theorem - moving loads - Influence lines - Arches - slope deflection method --moment distribution method - flexibility and stiffness methods - matrix approaches.

Concrete Structures: Limit State methods of design; design of reinforced concrete beams, slabs, columns, staircase, earth retaining structures and foundations; detailing of reinforcement; analysis and design of pre-stressed concrete beams, provisions of IS code of practice.

Steel Structures: Analysis and design of tension and compression members, beams and beam-columns, column bases; Connections - simple and eccentric, beam and column connections, plate and gantry girder and trusses; plastic design of beams and frames, provisions of IS codes of practice.

WATER RESOURCES ENGINEERING

Fluid Mechanics: Hydrostatic application of Bernullis's equation, laminar and turbulent flow through pipe lines, pipe network, concept of boundary layer and its growth, uniform flow, critical flow, Specific energy concepts, Hydraulic jump, forces on immersed bodies; flow measurement in channels, tanks and pipes, dimensional analysis and modeling; velocity triangles and specific speed of pumps and turbines. Application of momentum equation, potential flow, kinematics of flow.

Hydrology: Hydrologic cycle, rainfall; evaporation infiltration, unit hydrographs, flood estimation, reservoir and channel routing, well hydraulics.

Irrigation. Duty, Delta, Estimation of evapo-transpiration; crop water requirements; design of lined and unlined canals; water ways; head works, gravity darns and Ogee spillways, Earthen dams; Design of weirs on permeable foundation, Irrigation methods.

TRANSPORTATION ENGINEERING

Highway Development and Planning. Highway Development in India, Plans. Road Patterns, Alignment, Engineering-surveys for highway locations, Drawings and reports. **Highway Geometric Design:** Elements of cross section, sight distance, Horizontal and Vertical Alignment.

Traffic Engineering: Traffic studies, Volume, origin and destination studies, accident studies, Traffic signs, traffic islands, Intersection design, all grade and grade-separated intersections.

Highway Design, Construction and Maintenance: Highway Design, Construction and Maintenance of gravel, water bound, bituminous pavement and concrete pavements, maintenance of roads.

ENVIRONMENTAL ENGINEERING:

Sewage, characteristics of sewage, cycles of decay, decomposition of sewage, examination of sewage, BOD equation, COD.

Layout and general outline of water treatment units, sedimentation, principles, design factors, coagulation, flocculation, clarifier design, coagulants, feeding arrangements.

Filtration, theory, working of slow and rapid gravity filters, multimedia filters, design of filters, troubles in operation, comparison of filters, disinfection, theory of chlorination, chlorine demand, other disinfection practices.

Layout and general outline of various units in a waste water treatment plant, primary treatment, design of screens, merit chambers, skimming tanks, sedimentation tanks, principles of design, biological treatment trickling filters- standard and high rate, construction and design of oxidation ponds, sludge digestion, factors affecting and design of digestion tank, sludge disposal by drying, septic tanks working principles and design, soak pits.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M.TECH. (ELECTRICAL & ELECTRONICS ENGINEERING)

Disp. No. 2

UNIT -I: NETWORK THEORY:

General circuit concept - RLC Parameters - Response of RL - RC - RLC for impulse, step and sinusoidal excitations - Magnetic circuits - Single phase circuits - Concept of Real and Reactive powers - Power factor -Series & Parallel resonance - Three phase circuits - Star & delta connections - line & phase quantities - Analysis of balanced & unbalanced ckts. - Network theorems - Two port networks.

Unit - II: ELECTROMECHANICS

DC Generators - EMF equation - methods of excitation - characteristics of shunt, series and compound generators - DC Motors - Principle of operation - Torque equation - methods of speed control - efficiency -Applications - Single phase transformers - principle of operation - Phasor diagram - Equivalent circuit - iron and copper losses —efficiency - regulation - Polyphase induction motor - principle of operation - Phaser diagram - equivalent circuit - Torque equation - mech. Power developed - torque slip characteristics –

speed control methods & starting methods -Synchronous generators - Principle of operation - Armature reaction -leakage reactance - synchronous reactance & impedance - phasor diagram - voltage regulation - load - characteristics - synchronizing and parallel operation - Synchronous motor - theory of operation - phasor diagram - power developed - excitation & power circles - methods of starting.

UNIT - III: POWER SYSTEMS

Operation of Hydropower stations - Thermal Power Stations - Nuclear power Stations - Economic aspects of power station - transmission line parameters - types of conductors - calculation of inductance - capacitance for 2 wire and 3 wire systems. Transmission line performance - short, medium and long line - T and TT network models - ABCD constants - Ferranti effect - Corona - Insulators - Underground cables - Calculation of insulation resistance - Power factor improvement - Protection against over voltage

- Fuses - Circuit breakers - Currant limiting reactors - Electromagnetic & Static relays - application of relays - protection of busbars - transformers & generators - economic operation of power systems - load frequency control - single area and two area systems - power system transient & steady - state stability analysis, load flow studies.

UNIT - IV: CONTROL SYSTEMS

System concept - mathematical models of physical systems - block diagram algebra - feedback characteristics - reduction in parameter variations by use of feed back - PID controllers - time response analysis- concept of stability - frequency response analysis.

UNIT - V: POWER ELECTRONICS

Basic theory of operation of SCR, BJT and their characteristics - On & Off methods - Snubber circuits - di/dt, dv/dt protection - Line commutaled converters both midpoint & bridge type - Single Phase & 3 phase with R, RL loads - Output equations - waveforms - dual converters - AC Voltage controllers (single phase) with R, RL loads - output equation - waveforms - single phase cycle converter - principle of operation'- wave forms -forced commutation - techniques - D.C. choppers, single quadrant and two - quadrant operation - Output equation, wave forms - inverters - series & parallel inverters - single phase and three phase - operation - wave forms.

UNIT - VI : ELECTRICAL MEASUREMENTS

Measuring instruments - classification, ammeter, voltmeter - expression for deflection torque & control torque - Instrument

transformers - CT & PT - Measurement of active and reactive power in balanced load -Measurement of energy (single phase) - potentiometers - applications -bridges for resistance, inductance and capacitance measurements.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M.TECH (MECHANICAL ENGINEERING)

Disp. No.3

APPLIED MECHANICS AND DESIGN

Engineering Mechanics: Equivalent force systems, free-body concepts, equations of equilibrium, trusses .and frames, virtual work and minimum potential energy. Kinematics and dynamics of particles and rigid bodies, impulse and momentum (linear and angular), energy methods, central force motion.

Strength of Materials: Stress and strain, elastic constants, stress-strain relationship, Mohr's circle.

Deflection of beams, bending and shear stresses, shear force and bending moment diagrams, torsion of circular shafts, thin and thick cylinders, Euler's theory of columns, strain energy methods, thermal stresses.

Theory of Machines: Analysis of plane mechanisms, dynamic analysis of slider-crank mechanism, planar cams and followers, gear tooth profiles, kinematics and design of gears, governors and flywheels, balancing of reciprocating and rotating masses.

Vibrations: Free and forced vibration of single degree freedom systems, effect of damping, vibration isolation, resonance, critical speed of shafts.

Design of Machine Elements: Design for static and dynamic loading, fatigue strength, failure theories. Design of bolted, riveted and welded joints; design of shafts and keys; design of spur gears, brake4 and clutches,, rolling and sliding contact bearings; belt, ropes and chain drives.

THERMAL SCIENCE AND ENGINEERING

Fluid Mechanics: Fluid properties, fluid statics, manometry, buoyancy, control-volume analysis of mass, momentum and energy, fluid acceleration, differential equation of continuity and momentum. Bernoulli's equation. Viscous flow of incompressible fluids; boundary layer, flow through pipes, head losses in pipes, bends etc. turbo machines: velocity triangles Euler's equation, specific speed, Pelton wheel, centrifugal pump, Francis and Kapian. turbines.

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 practical correlations for heat transfer 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.

Thermodynamics: Zeroth, first and second laws of thermodynamics, thermodynamic system and processes irreversibility and availability, behaviour of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes, Analysis of thermodynamics cycles related to energy conversion. Carnot, Rankine, Otto, Diesel, Brayton and Vapour compression cycle.

Steam Engineering: Steam generators, Steam engines, steam turbines-impulse and reaction, velocity diagrams, compounding, reheat factor.

I.C. Engines; Requirements and suitability of fuels in IC engines, fuel ratings, fuel-air mixture requirements, normal combustion in 51 and Cl engines, engine performance calculations, components of gas turbine.

Reciprocating Air Compressor: sothermal, adiabatic and polytropic compression, staging the compression process, intercooling and aftercooling, minimum work requirement, volumetric efficiency. Centrifugal and axial flow compressors.

Refrigeration and Air-conditioning: Refrigerant compressors, expansion devices, condensers and evaporators, properties of moist air, psychrometric chart, basic psychrometric processes.

MANUFACTURING AND INDUSTRIAL ENGINEERING

Engineering Materials: Structure and properties of engineering materials and their applications, beat treatment.

Metal Casting: Casting processes - pattern making, moulds and cores, solidification, design of casting, casting defects.

Metal Working: Stress-strain diagrams for ductile and brittle material, plastic deformation, mechanisms, fundamentals of hot and cold working processes-forgoing, extrusion, wire drawing, sheet metal wording, punching, blanking,-bending, deep drawing, coining and spinning.

Metal Joining Processes. Fusion and non-fusion welding processes, design of welded joints, modern welding processes.

Machining Processes and Machine Tool Operation: Mechanics of metal cutting, single and multipoint cutting tools, geometry and machining aspects, tool life, machinability, economics of machining, non- traditional machining processes.

Metrology and Inspection: Limits, fits and tolerances, linear and angular measurements, comparators, gauge design, interferometry, form and finish measurement, measurement of screw threads, alignment and testing methods.

Tool Engineering: Principles of work holding, design of jigs and fixtures, design of press working tools.

Manufacturing Analysis.. Part-print analysis, tolerance analysis in manufacturing and assembly, time and cost analysis.

Computer Integrated Manufacturing: Basic concepts of CAD, CAM, Group technology.

Work Study. Method study, work measurement time study, work sampling, job evaluation, merit rating. Production Planning and Control. Forecasting models, aggregate production planning" master scheduling, materials requirements planning.

Inventory Control: Deterministic and probabilistic models, safety stock inventory control systems.

Operations Research: inear programming, simpler and duplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M.Tech. (Energy Systems)

Disp. No. 4

One-dimensional steady and unsteady state heat conduction: electrical analog, dimensional analysis, forced convection over flat plates and inside tubes, free convection over vertical and horizontal places, concepts of radiative heat transfer, Fick's Law of mass diffusions basic of convective mass transfer

Concept continuum, Macroscopic approach. Thermodynamic system, closed and open, Intensive and extensive properties thermodynamic equilibrium. State of system, state diagram path process. Zeroth law of Thermodynamic properties of pure substances in solid, liquid and vapour phases. P-V-T behaviour of simple compressible substances. Equations of state. Compressibilities and expansion coefficient. Thermodynamic property tables and charts.

First law of Thermodynamics, Kelvin-planch and Clausius statements. Carnot theorem. Reversible and irreversible processes. Thermodynamic (absolute) temperature scale. Clasius inequality and the concept of entropy. Principle of increase of entropy. Availability and irreversibility. applications of second law.

Power and Refrigeration cycles, Carnot, Rankine, Air standard Joule (Brayton) Otto, Diesel and Dual. Vapour Compression, Refrigeration.

Relations between power, torque and speed of rotating electrical machines Kirchhoff's laws. Resistors, inductors, capacitors and cells in series and parallel, energy stores in inductors and capacitors. Alternating voltage and current, instantaneous, maximum, average and RMS values, phasor addition, lagging and leading, power in a.c.circuits, power factor, three-phase systems, star and delta connections power measurement in three-phase systems.

Single-phase transformers: emf, equation, losses, efficiency, and regulation.

Three-phase induction motors, and slip-ring, slip power, torque slip characteristic. Starting methods, speed control.

Alternators synchronous impendance, voltage regulation. Utilization, Industrial applications of electric motors, selection of motors, motors for particular services. Utilization, Luminous, flux and intensity, laws of illumination. Electric lamps, street-lighting. Simple Tariff systems.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M.Tech.(Systems & Signal Processing)

Disp. No. 5

Semiconductor Devices: Characteristics, Applications, Amplifiers and Oscillator Circuits, Power Amplifiers and Tuned Amplifiers, Network Theorems, Noise, Fourier Transforms, Convolution, Laplace Transforms, Z. Transforms.

Boolean Algebra, Combinational Circuits, Sequential Circuits, Linear and non-Linear Wave Shaping, Multi-vibrators, Sweep Circuits, Linear and Digital ICs, A/D, D/A Converters.

EM Theory – Maxwell's Equations, Uniform Plane Waves, Transmission Lines, wave guides, Modulation Theory – AM, FM, PM, Pulse Modulation, PCM, DM, ADM, ASK, PSK, FSK Schemes. Antennas – Characteristics and Types, Wave Propagation.

Computer Components, 8085, 8086 Microprocessors, Data Communication Networking, ISDN, Micro controllers.

Electronics measuring instruments, CROs, Time and Frequency Measurements, DVMs, Transducers, Measurement of Physical Parameters. Control Systems: Transfer function of Linear Systems, Sensitivity function. Time Domain Analysis and Feed Back Control System, Root Locus Techniques.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M.TECH. (COMPUTER SCIENCE)

Disp. No. 6

Computer Hardware & Organisation: Number Systems, Representation Positive and negative integers and real numbers, logic gates, Boolean algebra, simplification of Boolean expressions, Combinational circuits, sequential circuits, Functional organization of computer, 8085 microprocessor instructions, concepts of machine language, assembly language and high level language, and operating systems.

Programming in C: Data types, Operators and Expressions, Input Output Statements, Control Statements, Functions, Arrays, Pointers, Structures & Unions, Preprocessors, Programming in C.

Data Structures: Searching and Sorting Techniques, Expression, Evaluation, Stacks, Queues, Linked Lists, Trees, Graphs and applications.

Discrete Mathematics: Sets and relations, Fundamentals of propositional logic, inference, elementary combinatories, Probability, Mathematical Induction.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M.TECH. (REMOTE SENSING AND GIS)

Disp. No. 7

I.   COMPUTER GRAPHICS AND PROGRAMMING COMPUTER GRAPHICS

Representative uses of computer graphics, framewor for interactive graphics, input devices, raster graphics features, scan converting lines, Incremental algorithm and mid point line algorithm for scan converting lines.

INTRODUCTION TO C :
Fundamentals, structure of C functions, variables constants, data types and arithmetic expressions, standard input – output functions, condictional statements.

PROGRAMMING IN C

Logical operations, program looping, operators, arrays, functions, structures, pointers, modular programming, user defined data types input out put from files libraries and generalized functions, recursion

Suggested Reading Material :
1. Programming in C by Stephen G Kochan – Schaum's Series
2. Computer Graphics by Foley, van Dam, Feiner, Hughes

II.   CONVENTIONAL SURVEYING REMOTE SENSING and PHOTORAMMETRY CONVENTIONAL SURVEYING and MAPPING.

Surveying methods, Topographics Surveying, Theodolite application, General features of Survey of India topographics sheets, Map scale, Indtroduction to Map scale, Introduction to Map projections, Introduction to cartography.

REMOTE SENSING PHYSICS AND SATELLITES :
Physical principles of Remote Sensing, Source of Electro magnetic energy, Electro Magnetic Spectrum, General aspects of India Space program.

PHOTOGRAMMETRY :
Aerial Photo formats, Scale of aerial photograph, Relief displacement, Eements of Photogrammetry, stereoscopic products and applications.
Suggested reading material :
1.   Physical Geography by Tikka
2.   Soil Physics By M.C. Oswal
3.   Geology by P.K.Mukhergie

III.   GEO-SCIENCES
GEOGRAPHY
Landforms origin, classification and distribution, elements of weather and climate, heating of atmosphere, temperature, atmospheric pressure, winds, humidity, evaporation and condensation, precipitation,

SOILS

Mechanical composition of soil-soil texture, soil structure. Irrigation – irrigation methods, soil salinity and water quality. Soil conservation – soil erosion water erosion, types of water erosion factors affecting soil erosion, estimation of soil loss; erosion control; wind erosion, factors influencing wind erosion, control of wind erosin

Suggested Reading material :
1. Physical Geography by Tikka
2. Soil Physics By M.C.Oswal
3. Geology by P.K.Mukhergie
IV. **PROBABILITY AND STATISTICS :**
PROBABILITY :
Sample space and events, axioms of probability, finite probability spaces, infinite sample Spaces, conditional probability, multiplication theorem for conditional probability, independence, independent or repeated trials, binomial distribution, normal distribution
STATISTICS :
Sample mean and sample variance, random variable discrete and continuous distributions, Mean and variance of a distribution, estimation of parameters, confidence intervals, testing of hypothesis.

Suggested Reading Material :

1. Probability and Statistics - Schaum's Series.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M.Tech. (Bio-Technology)

Disp. No. 8

Part – I:

Unit–1:

History of Microbiology, Classification of Protists. Morphological, Structural and Biochemical characteristics of procreates and Eukaryotes. Growth characteristics of microbes.

Methods of microbiology including pure culture techniques and microscopy. Industrially important micro organisms and important fermentation products.

Media formulation Principles of microbial nutrition, construction of culture media.

Unit-2:

Isolation, improvement and preservation of industrial micro-organisms.

Microbial Genetics: Transformation, Transduction and Conjugation, Structure and Classification of viruses, replication of viruses including bacteriophases and animal viruses.

Unit-3:

Structure of DNA and arrangement of genes on chromosomes, DNA synthesis and replication, RNA syntheses and processing, Different classes of RNA and their functions, Ribozymes, Protein expression in prokarytes and Eukarytes.

Plasmids, Transposable elements, TY Elements and repetitive sequences, Mutations.

Unit-4:

Structure of Bio-Molecules, Metabolism of Carbohydrates, liquids, proteins, amino acids and Nucleic acids, photosynthesis.

Unit-5:

Enzymes: Specificity, catalysis, kinetics, inhibition and allosteric enzymes. Metabolic organization and regulasation of metabolism. Signal Transduction.

Plasma Membrane: Structure and Transport, Signal Hypothesis.

Part – II:

Thermodynamics

First law of thermodynamics: Internal energy, enthalpy, molar heat capacities, reversible and irreversible processes. Isothermal and adiabatic changes. Second law: entrophy, Free energy change and chemical reaction equilibria. Heat of reaction, Hess's law, heat of formation, combustion etc.

Chemical Reaction Kinetics:

Rate of reactions: Molecularity, order and rate consists, Arrhenius equation, Energy of activation, catalysis design of Ideal Reactors for single reactions.

Mathematics:

Differential and integral calculus including integration Ordinary and partial differential equations. Laplace transforms of elementary functions, solution to ordinary differential equation by transform methods. Solutions of a system of linear algebraic equations by matrix method eigen values, of a square matrix. Fourier and Taylor's series. Mean value theorem.

Fluid Mechanics

Fluids vs Solids, Fluids statics and applications, Mass and energy balances in fluid flow, bernoulli's equation, its corrections and applications including pump work. Newton's law of viscosity, flow curves for non-newtonian fluids.

Pressure drop due to skin friction by Rayleigh's method of dimensional analysis – significance of friction, factor and Reynol's number. Boundary layer theory and form friction pressure drop due to form friction. Flow past immersed bodies and drag coefficients. Pressure drop in flow through packed beds. Fluidization and pressure drop across fluidized beds. Flow metering, machinery and control.

Heat Transfer

Modes of heat transfer and examples. Fourier's law of heat conduction and analogy with momentum transfer, heat transfer through a cylindrical pipe wall.

Convection and concept of heat transfer coefficient, application of dimensional analysis to heat transfer from pipe to a flowing fluid. Thermal boundary layer and prandtlnumber. Overall heat transfer coefficient.

Correlations for heat transfer coefficients in natural and forced convection, significance of dimensionless numbers. Overview of heat exchangers and concept of LMTD. Overview of other heat transfer operations, viz., boiling and condensation and evaporation. Overview of radiation, combined heat transfer by conduction – convection and radiation.

Diffusion and Mass Transfer

Fick's law of diffusion, analogy with momentum and energy transport, diffusivities of gases and liquids, fundamentals of mass transfer coefficient, dimensionless numbers and significance, correlation for mass transfer, overview of separation operations. Equipment for mass transfer operations. Equilibrium stage operations.

Mechanical Unit Operations

Principles of the following operations for size reduction and size separation, crushing, grinding, filtration, centrifugation.

Suggested Books for Part – I:

1. General Microbiology 5th Edition Stanier et al.
2. Molecular Biology of the gene 4th ed. Waston et al.
3. Genes IV BENJAMIN lewin.
4. General virology Luria and darnell.
5. Biochemistry L. Stry or Third Edition.
6. Biochemistry white Handler and R.B.
7. Principles of Biochemistry – A. Lehninger 1987.

Suggested Books for Part – II:

1. Unit Operations of Chemical Engineering 5th Edn. By W.L.Macabe.
2. Mass Transfer Operations by R.E. Treybal, Mc. Graw Hill.
3. Chemical Engineering Thermodynamics JM Smith and HC Vanness. Mc. Graw Hill.
4. Chemical Reaction Engg. D. Levenspiel.

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M.TECH.(WATER AND ENVIRONMENTAL TECHNOLOGY)

Disp. No.9

1. ECOLOGY & ENVIRONMENT: (15 Marks)

Nature of Ecosystems, Energy flow in Ecosystems, energy fixation by Autotrophs, Energy beyond the Proucers, Biogeochemical cycles and ecosystems,Ecology of populations,Population growth, Dynamics of ecological communities, National water Resources Problems with reference to the environment of major river valley projects

Suggested Reading Material:
1. Concepts of Ecology by E.J.Kormondy.

2. WATER POLLUTION AND WASTE WATER TREATMENT: (15 Marks)

Water Quality requirements for Drinking, Agricultural and Industrial uses, Surface and Ground water Pollution problems with reference to BOD,COD and suspended matter in the surface water, Fluoride, Nitrate, Arsenic and Iron Pollution problems in ground water of India, Water Treatment Process, Sedimentation, Coagulation and Filtration, Water Treatment process, Sedimentation, Coagulation and Filtration.
Suggested Reading Material:
1. Elements of Public health Engineering by K.N.Duggal
2. Environmental Engineering by G.S. Birdie
3. Waste water Treatment and Disposal by Metcalf and Eddy

3. FUNDAMENTALS OF SURFACE HYDROLOGY: (15 Marks)
Hydrologic Cycle – Precipitation: Different types and forms of precipitation and their Mechanism. Rain gauges, Evaporation and Transpiration: Concepts, measurements and factors affecting evaporation and transpiration. Infiltration – Concept, measurement and factors affecting infiltration, runoff, Definition and factors affecting runoff, stream gauging – computation of run off.

Suggested Reading Material:

1. Hydrology by H.M. Raghunath
2. A Text book of Hydrology by P. Jayarami Reddy

4. FUNDAMENTALS OF GROUND WATER HYDROLOGY: (15 Marks)

Occurrence of ground water in Consolidated and unconsolidated formations – Types of aquifers. Properties: Porosity, Specific Yield, Storativity, Hydraulic conductivity and transmissivity – Darcy's Law ,Ground Water management – artificial recharging methods.Types of wells, Openm wells, Tube wells, Construction of wells.
Suggested Reading Material:
1.Ground Water Hydrology by D.K. Todd
2.Ground Water by H.M.Raghunath

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M. Tech. (Environmental Management)

Disp. No.10

PART - 1

A. Ecology & Environment   (10 Questions)

    1.   Nature of ecosystems

    2. Energy flow in ecosystems-energy fixation by Autotrophs –Energy beyond the producers

    3.   Biogeochemical cycles and ecosystems

    4.   Ecology of populations - population growth - age structure - equilibrium level -

    5 .   Dynamics of ecological communities.

    Recommended Books: Concepts of Ecology, E. J. Kormondy, Prentice-Hall 1984

B. Microbiology   (10 Questions)

    1.   Major characteristics of microorganisms --- bacteria - metabolism

    2.   Growth microorganisms – Fungi, molds and yeasts - algae - protozoa – Viruses.

    3.   Control of microorganisms - physical and chemical agents.

    4.   Microorganisms in aerobic & anaerobic biological waste treatment- major groups of microbes and their role.

    5.   Microorganisms, growth kinetics- bacterial growth curve, various phases of growth, growth rate and doubling time.

    Recommended Books: Microbiology, M. J. Pelczar, E. C. S. Chan and McGraw - Hill, 1996

Part - II

A.   Environmental Chemistry   10 Questions

    1.   Basic concepts and scope of environmental chemistry – Environmental Segments.

    2.   Atmosphere - Structure - Chemical and photo chemical reactions – and ozone chemistry - green house effect.

    3.   Hydrosphere - hydrologic cycle – chemistry of water and waster water.

    4.   Lithosphere - micro and macro nutrients – Wastes and pollution of soil air and water.

    5.   Environmental technologies, Environmental effects of pollution – Health effects of pollution.

Recommended Books: Environmental Chemistry AK De, Willey Eastern Ltd.1992

B. . Pollution Control Engineering.

    1.   Solid, Liquid and Gaseous Wastes, Various Pollutants and their Harmful effects.

    2.   Waster quality, waster purificatrion systems.

    3.   Waste water characteristics, Primary / Secondary treatment methods.

    4.   Air Pollution control methods.

    5.   Dispersion of pollutants and self-purification aspects.

Books:

1.   Environmental Pollution and Control by C.S.Rao.

2.   Environmental Engineering by G.S. Birdie.

Part III:

1.   Origin and age of the earth, internal Constitution of the earth, Geological processes - Exegetic and endogenic, ligneous, metamorphic and sedimentary rocks, distinguishing features of these three types of rocks, basic principle of structural geology, geology of dams and reservoirs.

2.   Geomorphic cycle, geomorphic agents, definition of weathering, types of weathering physical and chemical, definition of erosion and denudation, cycle of erosion, landforms created by geomorphic agents.

3.   Map terminology: map reading, topographic map, conventional symbols, locating points, map projections and classification of maps.

4.   Aerial photogrametry: Definition, photo scale, classification of Ariel photographs, Air photo interpretation key elements, photo grammetric terminology.

5.   Remote Sensing: Electromagnetic energy, Electro magnetic spectrum, various satellites and sensors, latest advancements in satellite remote sensing, General knowledge on Indian remote sensing Programmes.

Suggested Reading

1.   A text book of Geology by P.K.Mukharjee

2.   Text book of Geomorphology by Thombury

3.   Principle of Remote Sensing by P.J.Curran

4.   Elements of Photo grammeteries by K.K. Rampal

B. Elementary Mathematics, Statistics and Computer Science (10 questions)

1.   Elementary Mathematics: Solutions of simultaneous linear equations, quadratic equations, progressions, perambulations and combinations, concepts of matrices and determinants.

2.   Statistics: sample mean and variance, random variable, distributed and continuous distributions, mean and variance of distribution, correlation, coefficient, confidence intervals, goodness of fit, test, pairs of measurements, fitting straight lines.

3.   Introduction to computers and programming: components of computers, characteristics of computer, modes of operation, type of computer algorithms, flowcharts, programming languages, operating systems, fundamentals, of C, structure of C, variables and constants, arithmetic and logical expressions, standard output-input functions, conditional statements and looping in C, various types of functions.

Suggested –Reading:
1. Computer Programming with C by E. Balaguruswamy.
2. Elements of Statistics by Gupta.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M. Tech. Metallurgical Engineering
(Industrial Metallurgy)

Disp. No.11

Thermodynamics and Rate Processes: Laws of thermodynamics, activity, equilibrium constant, applications to metallurgical systems, solutions, phase equilibria, Ellingham and phase stability diagrams, thermodynamics of surfaces, interfaces and defects, adsorption and segregation; basic kinetic laws, order of reactions, rate constants and rate limiting steps; principles of electro chemistry- single electrode potential, electro-chemical cells and polarizations, aqueous corrosion and protection of metals, oxidation and high temperature corrosion - characterization and control; heat transfer - conduction, convection and heat transfer coefficient relations, radiation, mass transfer - diffusion and Fick's laws, mass transfer coefficients; momentum transfer - concepts of viscosity, shell balances, Bernoulli's equation, friction factors.

Physical Metallurgy: Crystal structure and bonding characteristics of metals, alloys, ceramics and polymers, structure of surfaces and interfaces, nano-crystalline and amorphous structures; solid solutions; solidification; phase transformation and binary phase diagrams; principles of heat treatment of steels, cast iron and aluminum alloys; surface treatments; recovery, recrystallization and grain growth; industrially important ferrous and non-ferrous alloys; elements of X-ray and electron diffraction; principles of scanning and transmission electron microscopy; industrial ceramics, polymers and composites; electronic basis of thermal, optical, electrical and magnetic properties of materials; electronic and opto-electronic materials.

Mechanical Metallurgy: Elasticity, yield criteria and plasticity; defects in crystals; elements of dislocation theory - types of dislocations, slip and twinning, source and multiplication of dislocations, stress fields around dislocations, partial dislocations, dislocation interactions and reactions; strengthening mechanisms; tensile, fatigue and creep behaviour; super-plasticity; fracture - Griffith theory, basic concepts of linear elastic and elasto-plastic fracture mechanics, ductile to brittle transition, fracture toughness; failure analysis; mechanical testing - tension, compression, torsion, hardness, impact, creep, fatigue, fracture toughness and formability.

Manufacturing Processes: Metal casting - patterns and moulds including mould design involving feeding, gating and risering, melting, casting practices in sand casting, permanent mould casting, investment casting and shell moulding, casting defects and repair; hot, warm and cold working of metals, Metal forming - fundamentals of metal forming processes of rolling, forging, extrusion, wire drawing and sheet metal forming, defects in forming; Metal joining - soldering, brazing and welding, common welding processes of shielded metal arc welding, gas metal arc welding, gas tungsten arc welding and submerged arc welding; welding metallurgy, problems associated with welding of steels and aluminium alloys, defects in welded joints; powder metallurgy; NDT using dye-penetrant, ultrasonic, radiography, eddy current, acoustic emission and magnetic particle methods. Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, principles of design of jigs and fixtures

PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M. Tech. (Biopharmaceutical Technology)

Disp. No. 12

I.   **Pharmaceutics:** Development, manufacturing standards Q.C. limits, labeling, as per the Pharmacopoeal requirements, Storage of different dosage forms like solid dosage forms, liquid dosage forms, semi-solid dosage forms and aerosols and of new drug delivery systems Biopharmaceutics and Pharmacokinetics and their importance in formulation. A details study of buffers and isotonic solutions, solubility of pharmaceuticals, interfacial phenomena, colloids, stability of colloids, rheology, thixotropy and its applications, micro meritics. A details study of the concept of chemical kinetics and their application in pharmacy.

II.   **Pharmacology:** General pharmacological principles including Toxicology. Drug interaction, Pharmacology of drugs acting on central nervous system, cardiovascular system, Autonomic nervous system, Gastro intestinal system and Respiratory system. Pharmacology of Autocoids, Hormones, Hormone antagonists, Chemotherapeutic agents including anticancer drugs. Bio assays, immuno Pharmacology. Drugs acting on the renal system.

III. **Pharmocognosy:** Pharmacognosy of crude drugs that contain the following constituents. Alkaloids, Glycosides, Terpenoids, Steroids, Bioflavanoids, Purines, volatile oils, resins, seponines. Chemistry, tests, isolation, Characterization and estimation of phyto pharmaceuticals belonging to the above groups. Study of mineral drugs like bentonite, kaolin, talc and kieselguhr. Standardization of raw materials and herbal products. Quantitative microscopy including modern techniques used for evaluation of crude drugs. Biotechnological principles and techniques for plant development, Tissue culture. Fermentation technology and its applications in pharmacy.

IV.   **Pharmaceutical Chemistry:** Structure, nomenclature, classification, synthesis, SAR and metabolism of the following category of drugs & Stereochemistry of drug molecules. Preparation and storage and uses of official Vitamins and Hormones.

V.   **Microbiology:** Morphological, Structural and Biochemical characteristics of procreates and Eukaryotes. Growth characteristics of microbes. Methods of microbiology including pure culture techniques and microscopy. Industrially important micro organisms and important fermentation products. Media formulation Principles of microbial nutrition.

VI.   **Molecular Biology:** Structure of DNA and arrangement of genes on chromosomes, DNA synthesis and replication, RNA syntheses and processing, Different classes of RNA and their functions, Ribozymes, Protein expression in prokarytes and Eukarytes. Plasmids, Transposable elements, TY Elements and repetitive sequences, Mutations.

VII. **Biochemistry:** Structure of Bio-Molecules, Metabolism of Carbohydrates, liquids, proteins, amino acids and Nucleic acids, photosynthesis. Enzymes: Specificity, catalysis, kinetics, inhibition and allosteric enzymes. Metabolic organization and regulasation of metabolism. Signal Transduction. Plasma Membrane: Structure and Transport, Signal Hypothesis.

VIII.	**Fluid Mechanics:** Fluids vs Solids, Fluids statics and applications, Mass and energy balances in fluid flow, bernoulli's equation, its corrections and applications including pump work. Newton's law of viscosity, flow curves for non-newtonian fluids.

IX.	**Heat Transfer:** Modes of heat transfer and examples. Fourier's law of heat conduction and analogy with momentum transfer, heat transfer through a cylindrical pipe wall. Convection and concept of heat transfer coefficient, application of dimensional analysis to heat transfer from pipe to a flowing fluid. Thermal boundary layer and prandtlnumber. Overall heat transfer coefficient.

X.	**Diffusion and Mass Transfer:** Fick's law of diffusion, analogy with momentum and energy transport, diffusivities of gases and liquids, fundamentals of mass transfer coefficient, dimensionless numbers and significance, correlation for mass transfer, overview of separation operations. Equipment for mass transfer operations. Equilibrium stage operations.

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M.Sc. Chemistry
(Drugs & Pharmaceuticals)

Disp. No. 13

PYSICAL CHEMISTRY

ATOMIC STRUCTURE : Hydrogen spectrum, plank's quantum theory Bohr's theory of hydrogen atom, Energy levels and explanation of hydrogen spectra, limitations of Bohr's Theory. Quantum numbers, wave nature of electron and uncertainity principle – Schrodinger wave equation Dependence of probability functions on distance from nucleus and directions – shapes of atomic orbitals (Calculation involving frequency and Rydberg's constants), Concept of chemical bonding ionic bonding and covalent bonding.

CHEMICAL EQUILIBRUM : Reversibility – Dynamic nature of equilibrium Kp, Kc and their interrelation, derivation of quantitative expression for equilibrium constants for a few typical reactions, factors effecting the equilibrium constants.

GASEOUS STATE : kinetic theory of gases – Derivation of kinetic equation and deduction of gas laws – Mean free path, collision number and collision diameter – principle of equipartition of energy – Heat capacities for mono, di and tri atomic molecules deviation from gas laws –vanderwaal's equation Critical phenomenas – Isotherms of carbondioxide – Determination of critical constants – Derivation of relation between vanderwaal's constants and critical constants – law of corresponding states and its usefulness/applications.

SOLUTIONS : Solution of gases in liquids – Henry's Law – Binary liquid mixtures – partial miscibility – Critical solution temperature – complete miscibility – Deviation from Raoult's law distillation of completely miscible mixtures – Azeotropic mixtures – complete immiscibility – steam distillation Distribution law and its applications.

THERMODYNAMICS : Definition of terms – First law of thermodynamics and its application to gases – Heat capacities at constant valume and constant pressure – Isothermal and adiabatic changes Joule Thompson effect – Work of expansion Reversible Pressure and maximum work. Heat changes in chemical reaction at constant pressure and constant volume and their inter relationship – Heats of formation, combustion, solution, dilution, and neutralization, Hess law and its applications – Kirchoff's equation – second law of thermodynamics – Carnot cycle – entropy change elementary concept of entropy and free energy.

ELECTROCHEMISTRY : (a) Conductance – Specific conductance, equivalent conductance – Measurements and their dependence on concentration – Acid base conductometric titrations – Transport numbers and determination by Hittorf's method – Kohlrausch law and its applications (b) Ionic product of water pH, buffer solutions, calculations of pH of buffer solutions Henderson equation – Acid base indicators – pH at the equivalence point, theories of indicators – Solubility product and common ion effect-Hydrolysis of salts – degree of hydrolysis and hydrolysis constant (c) Electromotive force of Electrochemical cells.

INORGANIC CHEMISTRY:

s-Block Elements Group 1A – The Alkali Metals: General properties – Standard electrode potentials – principles of extraction uses of metals – Reactivity of elements - Oxides – hydroxides – hydrides – halides – nitrides, carbonates and bicarbonates ammonia solutions – anomalous nature of Lithium.

p-Block Elements – Group IIIB: General group trends principle of extraction – reactivity of elements – oxides – hydroxides – hydrides – halides – comparison of Boron with other elements of group III electron deficient compounds of Boron and Aluminium. Boric acid and Borax.

Group VIIB: The Halogens: General group trends principles of extraction – reactivity of elements – electrode potentials – hydroxides – oxyacids – interhalogen compounds – pseudo halogens – basic character of Iodine.

d-Block Elements: Electronic configuration – general properties – reactivity of metals – ionic size ionization potentials – Valencies – Ability to form complexes – General comparison of the elements of second and third transition series with the transition series with reference to ionic and covalent radii and oxidation states.

f-Block Elements: Electronic configuration – general properties – ionic size – Oxidation states – Complexes – Lanthanide contraction – ionic, covalent raddi and oxidation states.

Co-ordination Compounds : Double salts and coordination compounds early theories of coordination compounds – Werner's theory – Sidgwick;s electronic interpretation – EAN rule – nomenclature – magnetic criteria of bond type – valence bond theory Elementary treatment of crystal field theory, splitting of d-orbitals for octahedral, square planar and tetrahedral geometry – isomerism – stereoisomerism & geometrical isomerism – optical isomerism – Detection of formation of complexes – Composition by Job's method – stability constants – Factors affecting the stability of complexes – importance of complexes in qualitative and quantitative analysis.

ORGANIC CHEMISTRY:

Reactivity of Organic Molecules: Types of organic reagents and reactions, fission of covalent bonds, electrophilic, nucleophilic and free radical reagents – explanation of substitution, addition and elimination reactions with examples – bond lengths, bond angles, bond dissociation energies, bond polarization, inductive and mesomeric effects – acidity and basicity of organic molecules.

Halogen Compounds: Reactivity based on structure – preparation of alkyl halides – Mechanism and stereochemistry of nucleophilic substitution – relative reactivity of alkyl and aryl halides polyhalogen compounds, fluoro compounds isomerism in halogen derivatives.

Hydroxy Compounds: Reactivity based on structure preparation alcohols and phenols – physical properties and hydrogen bonding chemical properties comparison of reactivity of alcohols and phenols – polyhydroxy compounds, ethylene glycol and glycerol – Industrial significance of methanol, ethanol, ethylene glycol, glycerol and phenol.

Carbonyl Compounds: (Aldehydes and Ketones): Reactivity based on structure – preparation and properties – mechanism of nucleophilic addition – Aldol, Cannizzaro, Grignard and benzoin condensation – Addition of $NaHSO_3$, HCN differences in the reactivity of aliphatic and aromatic aldehydes and in aldehydes and ketones.

Nitrogen Compounds: Alkyl nitrites and nitro alkanes – nitrobenzene – amines, classification, preparation, basic character reactivity and separation – aryl diazonium salt and their synthetic applications – cyanides and isocyanides.

Carbohydrates: Classification – open chain and cyclic structures of glucose and fructose, interconversion in monosaccharides (mention the configuration of (+) glucose and (-) fructose).

Heterocylic Compounds: Furan, Thiophene and Pyrrole – methods of synthesis, aromatic character and reactivity.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

Disp. No. 14

M.Sc. PHYSICS

(Fibre Optics & Communication)

1. Mechanics:

Laws of motion, motion in a uniform field, components of velocity and acceleration in different coordinate systems. Uniformly rotating frame, centripetal acceleration, Coriolis force and its applications.

Motion under a central force, Kepler's law. Gravitational law and field. Potential due to a spherical body, Gauss and Poisson equations for gravitational self-energy.

System of particles, center of mass, equation of motion, conservation of linear and angular momenta, conservation of energy, elastic and inelastic collisions.

2. Properties of matter:

Elasticity, small deformations, Hooke's law, elastic constants for an isotropic solid, beams supported at both ends, cantilever, torsion of a cylinder, bending moments and shearing forces.

Kinematics of moving fluids, equations of continuity, Euler's equation, Bernaulli's theorem, viscous fluids, streamline and turbulent flow. Poiseulle's law. Capillary tube flow, Reynold's number, stokes law.

Surface tension and surface energy, molecular interpretations of surface tension, pressure on a curved liquids surface, wetting.

3. Kinetic Theory of Matter

Ideal Gas: kinetic model, deduction of Boyle's law, interpretation of temperature, estimation of rms speeds of molecules. Brownian motion, estimate of the Avagadro number. Equipartition of energy, specific heat of monatomic gas, extension to di- and tri-atomic gases, behavior at low temperatures. Adiabatic expansion of an ideal gas, applications to atmospheric physics.

Real Gas: Van der Waal gas, equation of state, nature of Van der Waals forces, comparison with experimental P-V curves. The critical constants, gas and vapor. Joule expansion of ideal gas, and of a Van der Waals gas, Joule coefficient,

Liquification of gases: Boyle temperature and inversion temperature. Principle of regenerative cooling and of cascade cooling, liquification of hydrogen and helium. Refrigeration cycles, meaning of efficiency.

4. Thermodynamics

The laws of thermodynamics: The Zeroth law, various indicator diagrams, work done by and on the system, first law of thermodynamics, internal energy as a state function and other applications. Reversible and irreversible changes, Carnot cycle and its efficiency, Carnot theorem and the second law of thermodynamics. Different versions of the second law, practical cycles used in the internal combustion engines. Entropy, principle of increase of entropy. The thermodynamics scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero; third law of thermodynamics.

5. Oscillations:

Potential well and periodic oscillations, case of harmonic oscillations, differential equation and its solution, kinetic and potential energy, examples of simple harmonic oscillations, spring and mass system, simple and compound pendulum, torsional pendulum, bifilar oscillations. Helmholtz resonator, LC circuit Superposition of two simple harmonic motions of the same frequency along the same line, interference, superposition of two mutually perpendicular simple harmonic vibrations of the same frequency, Lissajous figures, case of different frequencies.

6. Waves

Waves in media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, energy density and energy transmission in waves, typical measurements. Waves over liquid surface: gravity waves and ripples. Group velocity and phase velocity, their measurements.

Superposition of waves: Linear homogenous equations and the superposition principle, nonlinear superposition and consequences.

Standing waves: Standing waves as normal modes of bounded systems, examples, Harmonics and the quality of sound; examples Production and detection of ultrasonic and infrasonic waves and applications.

7. Geometrical Optics & Physical Optics

Geometrical Optics:

Fermet's Principle: Principle of extreme path, the aplanatic points of a sphere and other applications.

General theory of image formation: Cardinal points of an optical system, general relationships, thick lens and lens combinations. Lagrange equation of magnification, telescopic combinations, telephoto lenses and eyepieces.

Aberration in images: Chromatic aberrations, achromatic combination of lenses in contact and separated lenses.

Optical instruments: Entrance and exit pupils, need for a multiple lens eyepiece, common types of eyepieces.

Physical Optics:

Interference of a light: The principle of superpositions, two-slit interference, coherence requirement for the sources, optical path retardations, lateral shift of fringes, Rayleigh refractometer and other applications. Localized fringes; thin films, applications for precision measurements for displacements.

Fresnel diffraction: Fresnel half-period zones, plates, straight edge, rectilinear propogation.

Fresnel diffraction: Diffraction at a slit, half –period zones, phasor diagram and integral calculus methods, the intensity distribution, diffraction at a circular aperture and a circular disc, resolution of images, Rayleigh criterion, resolving power of telescope and microscopic systems, outline of phase contract microscopy.

Diffraction gratings: Diffraction at N parallel slits, intensity distribution, plane diffraction grating, reflection grating and blazed grating.

Double refraction and optical rotation: refraction, in uniaxial crystals, its electromagnetic theory, phase retardation plates, double image prism. Rotation of plane of polarization, origin of optical rotation in liquids and in crystals.

8. Relativity

Reference systems, inertial frames, Galilean invariance and conservation laws, propagation of light, Michelson-Morley experiment; search for ether.

Postulates for the special theory of relativity, Lorentz transformations, length contraction, time dilation, velocity addition theorem, variation of mass with velocity, mass-energy equivalence, particle with a zero rest mass.

9. Quantum Mechanics

Origin of the quantum theory: Failure of classical physics to explain the phenomena such as black-body spectrum, photoelectric effect, Ritz combination principle in spectra, stability of an atom. Planck's radiation law, Einstein's explanations of photoelectric effect, Bohr's quantization of angular momentum and its applications to hydrogen atom, limitations of Bohr's theory.

Wave-particle duality and uncertainty principle: de Broglie's hypothesis for matter waves; the concept of wave and group velocities, evidence for diffraction and interference of 'particles', experimental demonstration of matter waves.

Consequences of de Broglie's concepts; quantization in hydrogen atom; energies of a particle in a box, wave packets, Heiesnberg's uncertainity relation for p and x, its extension to energy and time.

Consequences of the uncertainty relation: gamma ray microscope, diffraction at a slit, particle in a box, position of electron in Bohr orbit.

Quantum Mechanics: Schrodinger's equation. Postulatory basis of quantum mechanics; operators, expectation values, transition probabilities, applications to particle in a one and three dimensional boxes, harmonic oscillator, reflection at a step potential, transmission across a potential barrier.

10. Nuclear Physics

Interaction of charged particles and neutrons with matter, working of nuclear detectors, G-M counter, proportional counter and scintillation counter, cloud chambers, spark chamber, emulsions.

11. Solid State Devices

Semiconductors: Intrinsic semiconductors, electrons and holes, Fermi level. Temperature dependence of electron and hole concentrations. Doping; impurity states, n and p type semiconductors, conductivity, mobility, Hall effect, Hall coefficient.

12. Electronics

Power supply: Diode as a circuit element, load line concept, rectification, ripple factor, zener diode, voltage stabilization, IC voltage regulation, characteristics of a transistor in CB, CE and CC mode, graphical analysis of the CE configuration, low frequency equivalent circuits, h-parameters, bias stability, thermal runaway.

13.Electrostatics:

Coulombs law in vacuum expressedin vector forms, calculations of E for simple distributions of charged at rest, dipole and quadrupole fields.

Work done on a charge in a electrostatic field expressed as a line integral, conservative nature of the electrostatic field. Electric potential ϕ, $E = -\nabla\phi$, torque on a dipole in a uniform electric field and its energy, flux of the electric field, Gauss's law and its application for finding E for symmetric charge distributions, Gaussian pillbox, fields at the surface of a conductor. Screening of E

field by a conductor, capacitors, electrostatic field energy, force per unit area of a surface of a conductor in an electric field, conducting sphere in a uniform electric field, point charge in front of a grounded infinite conductor.

Dielectrics, parallel plate capacitor with a dielectric, dielectric constant, polarization and polarization vector, displacement vector D, molecular interpretation of Claussius-Mossotti equation, boundary conditions satisfied by E and D at the interface between two homogenous dielectrics

14. Electric Currents (steady and alternating)

Steady current, current density J, non steady currents and continuity equation, Kirchoff's law and analysis of multiloop circuits, rise and decay of current in LR and CR circuits, decay constants, transients in LCR circuits, AC circuits, complex numbers and their applications in solving

15. Magneto-statics

Force on a moving charge; Lorentz force equation and definition of B, force on a straight conductor carrying current in a uniform magnetic field, torque on a current loop, magnetic dipole moment, angular momentum and gyromagnetic ratio.

Biot and Savert's law, calculation of H order in simple geometrical situations, Ampere's Law $\nabla.B=0$, $\nabla \times B= \mu_0 J$, field due to a magnetic dipole, magnetization current, magnetization vector,

16. Time Varying Fields

Electromagnetic induction, Faraday's law, electromotive force, $\varepsilon= \int E.dr$, integral and differential forms of Faraday's law, mutual and self inductance, transformers, energy in a static magnetic field. Maxwell's displacement current, Maxwell's equations, electromagnetic field energy density.

17. Electromagnetic Waves

The wave equation satisfied by E and B, plane electromagnetic waves in vacuum, Poynting's vector, reflection at a plane boundary of dielectrics, polarization by reflection and total internal reflection, Faraday effect, waves in a conducting medium, reflection and refraction by the ionosphere.

18. Lasers

Laser system: Purity of a special line, coherence length and coherence time, spatial coherence of a source, Einstein's A and B coefficients, Spontaneous and induced emissions, conditions for laser action, population inversion.

Application of lasers: Pulsed lasers and tunable lasers, spatial coherence and directionality, estimates of beam intensity, temporal coherence and spectral energy density.

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

M. B. A.

(HR / Finance / Marketing / Systems)

Section A: **Analytical / Reasoning ability**   **(20M)**

(a). Problem solving   (b) Data Sufficiency

Section B: **Mathematical ability**   **(20M)**

(a). Arithmetical ability   (b). Algebraic and Geometrical ability   (c). Statistical ability

Section C: **Communication ability**   **(20M)**

(a). Vocabulary   (b). Business Terms   (c). Functional grammar   (d). Reading comprehension

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PTPG-2013
(ENTRANCE EXAMINATION SYLLABII)

Disp. No. 16

PG DIPLOMA IN NANOTECHNOLOGY

I. **MATHEMATICS:** Complex numbers and Quadratic Equations, Matrices and Determinants, Permutations and Combinations, Binomial theorem and its simple applications, Sequences and Series, Limit-Continuity and Differentiability, Integral Calculus, Differential Equations, Co-Ordinate Geometry, Three Dimensional Geometry, Vector Algebra, Statistics and Probability.

II. **PHYSICS:** Physics and Measurement, Kinematics, Laws of Motion, Work-Energy and Power, Rotational Motion, Gravitation, Properties of Solids and Liquids, Thermodynamics, Kinetic Theory of Gases, Oscillations and Waves, Electrostatics, Current Electricity, Magnetic effects of Current and Magnetism, Electromagnetic Induction and Alternating Currents, Electromagnetic Waves, Optics, Dual Nature of Matter and Radiation, Atoms and Nuclei, Electronic Devices.

III. **CHEMISTRY:** Physical Chemistry: Some Basic Concepts in Chemistry, States of Matter, Atomic Structure, Chemical Bonding and Molecular Structure, Chemical Thermodynamics, Solutions, Equilibrium, Chemical Kinetics, Surface Chemistry.

Inorganic Chemistry: Classification of Elements and Periodicity in Properties, General Principles and Processes of Isolation of Metals, Hydrogen, S-Block Elements (Alkali and Alkaline Earth Metals), P-Block Elements, Transition, Environmental Chemistry.

Organic Chemistry: Purification and Characterisation of Organic Compounds, Some Basic Principles of Organic Chemistry, Hydrobarbons, Organic Compounds containing Halogens, Organic Compounds containing Oxygen, Organic compounds containing Nitrogen, Polymers, Bio Molecules, Chemistry in Everyday life.

IV. **GENERAL BIOLOGY:** Cell Structure-Function and Cell Division, Structure and Function of Nucleic Acids, Biostatistics and Bioinformatics, Biomelecules, Enzymes, Principles and Applications of Biophysical Techniques, Recombinant DNA Technology, Basics of Immunology, Environmental Biotechnology, Toxicology.

V. **PROGRAMMING IN C, DATA STRUCTURES & DISCRETE MATHEMATICS:** Data types, Operators and Expressions, Input Output Statements, Control Statements, Functions, Arrays, Pointers, Structures & Unions, Preprocessors, Programming in C.Searching and Sorting Techniques, Expression, Evaluation, Stacks, Queues, Linked Lists, Trees, Graphs and applications.Sets and relations, Fundamentals of prepositional logic, inference, elementary combinatories, Probability, Mathematical Induction.

VI. **ELECTRONICS & CONTROL SYSTEMS:** power supply : Diode as a circuit element, load line concept, rectification, ripple factor, zener diode, voltage stabilization, IC voltage regulation, characteristics of a transistor in CB, CE and CC mode, graphical analysis of the CE configuration, low frequency equivalent circuits, h-parameters, bias stability, thermal runaway.System concept – mathematical models of physical systems – block diagram algebra – feedback characteristics – reduction in parameter variations by use of feed back – PID controllers – time response analysis – concept of stability – frequency response analys

VII. Mechanical Properties of materials-Basic Engineering mechanics

VIII. Introduction to nanotechnology- carbon nanotubes

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