SYLLABUS FOR DIRECT RECRUITMENT

FOR THE POST OF

ASSISTANT DIRECTOR (TECHNICAL)

IN THE DEPARTMENT OF

PRINTING, STATIONERY &

PUBLICATIONS, BANGALURU

As Per the Department present C & R following are the Qualification criteria :
**Must be a holder of Degree in Engineering in Mechanical/Electronics/
Printing Technology/Computer Science or
Master's Degree in Science (Physics OR Chemistry)**

B. E. (MECHANICAL) SYLLABUS

1. Thermodynamics law, properties of ideal gases and vapour's, power cycle, Gas power cyles, Gas Turbine cycles, fuels and combustion.

2. I.C. Enginees : CI and SI Engines, Detonation, Fuel injection and car buration. performance and testing, Turbojet & Turbo pro Engines, Rocket Engines, Elementary knowledge of Nuclear power plant and Nuclear Fuels.

3. Steam Boiler, Engines, Nozzles and Steam turbines modern Boilers, Steam Turbines types flow of steam through Nozzles, Velocity diagram for impulse and reaction turbine efficiency and governing.

4. Compressors, Gas Dynamics and Gas Turbines Reciprocating centrifugal and axial flow compressor, velocity diagrams, efficiency and performance, Effect of mechanical number on flow, isentropic flow, Normal Shocks and flow through Nozzles gas turbine cycle with multistage compression reheating the regeneration.

5. Heat transfer, Refrigeration and Air Conditioning, conduction, convention. and Radiation, Heat exchangers, types, combined Heat transfer, overall Heat transfer co-efficient, Refrigeration and heat pump cycles. Refrigeration systems. Co-efficient of performance. Psychometrics and psychometric chart, comfort indices cooling and dehumidification methods. Industrial Air conditioning process. Cooling and heating loads. Calculations.

6. Prosperities and classification of fluids. Fluids statistics. Kinematics and dynamics; principal and applications. Monometry and Buoyancy. Flow of ideal fluids. Laminar and turbulent flow. Boundary Layer theory. Flow over immersed bodies. Flow through pipes and open channels. Dimensional analysis and similitude technique. Non dimensional specific speed, and classification of fluid mechanics in general. Energy transfer relation performance and operation of pumps and of impulse and reaction water turbines. Hydronamic power transmission.

7. Theory of machines. Velocity and acceralations. (1) of moving bodies, (2) in machines. klien's construction, Inertia forces in machines. Carns, Gears and Gearing. Fly wheels and governors. Balancing of rotating and Reciprocating masses. Free & forced vibrations of systems. Critical speeds and whirling of shafts.

8. Machine design; Design of joints, Threaded fastner's and power screws –keys, Kotters coupling welded joints. Transmission system Belt & Chain drives wire ropes. Shafts. Gears, Sliding and Rolling Bearings.

9. Strength of material's ; stress and strain in two dimensions ; Mohr's Circles ; relation between Elastic constants.

    - Beams Bending movements, Shearing forces and reflection.
    - Shafts combined Bending, direct and torssional stresses. Thick Walled cylinder and sphere under pressure, springs, strcuts and columns, theories of failure.

10. Engineering materials; Alloys and Alloying of materials, heat treatment; composition, properties and uses, plastics and other newer engineering materials.

11. Production Engineering; Metal machinery: cutting tools: tool material, wear and mach inability, measurement of cutting forces.

   - Processes: machining, grinding, Boring, Gear, manufacturing, metal forming, metal casting & Jointing. Basic special purpose, programme & numerically controlled machine tool, Jigs and fixtures (locating Elements)

12. Industrial Engineering: Work Study and Work measurement wage incentive, Design of Production system and product cost, Principles of Plant Layout.

13. Production planning and control material handling, operations Research, Linear programming queuing Theory, Value Engineering, Network Analysis CPM & PERT, Use of computers.

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B.E. (ELECTRONICS) SYLLABUS

UNIT-I Semiconductor Diode Mechanism of Conduction in Semiconductors: Mobility and Conductivity, Electrons and holes in an intrinsic semiconductors, Donor and acceptor impurities, Fermi level, Carrier densities in semiconductor, Hall effect, Diffusion, Recombination Junction Diode PN junction characteristic and its equation, Effect of Temperature, Depletion Layer, Piecewise linear diode model, Breakdown Mechanism, Zener and Avalanche Breakdown characteristics Diode as circuit element Half wave and full wave rectifiers, capacitive filters, Zener diode as a regulator, clamper, clipper and voltage doubler, special diode- LED, Schottkey diodes (8)

UNIT-II BJT characteristics and circuits Transistor Operation, CE, CB, CC configuration and their characteristics, transistor biasing circuits, stability factor, h- parameter model (low frequency), computation of Ai, Av, Ri, Ro of single transistor CE amplifier configuration. (8)

UNIT-III Field Effect Transistors JFET: Construction and principle of working, Drain / Transfer characteristics, basic amplifier circuits, Biasing of JFET MOSFET: Enhancement and depletion type N-channel, P-channel, Drain / Transfer Characteristics. (8)

UNIT-IV Switching theory & Logic gates Number system, Conversion, Compliments, Addition and Subtraction, BCD numbers, Boolean algebra, Canonical form, Logic gates, Minimization of logical function using Karnaugh map (8)

UNIT-V Operational Amplifier Concept of ideal operational amplifier (inverting and non-inverting) and its applications, Inverter, integrator, differentiator, voltage follower, summing and differential amplifier

Electronic Instruments: Digital Multimeter (block diagram approach), CRO (block diagram and its 16 working),Measurement of voltage, phase, frequency. Double beam CRO (block diagram & its working). (8)

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B.E. (PRINTING) SYLLABUS

1. **Introduction to printing process**

    1.1 Evolution of Printing - Invention of movable wooden and metal type printing.- Lithography-Offset Printing-Intaglio Gravure, Flexography, Screen Printing and Digital Printing

    1.2 Structure of Printing Industry- Pre-media, Prepress - Film reproduction, Image assembly, Plate making and Digital prepress, Press and Post Press Sections Flow chart.

    1.3 Applications of Printing Process – Offset, Intaglio, Gravure, Flexography, Screen Printing and Digital printing.

    State the history and evolution of Printing Familiarise with different processes of printing industry. Use the different printing process.

2. **Principles of Printing Processes**

    2.1 Basic Principles of Letterpress, Offset, Flexography, Gravure, Screen Printing and Digital Printing

    2.2 Advantages and Limitations of Printing process- Letterpress, Offset, Flexography, Gravure and Screen Printing. Explain basic principle of printing processes

    Distinguish the merits and demerits of printing processes

3. **Introduction to Design and Layout**

    - Design, Introduction to graphic design-goal, audience, venue and budget.
    - Design elements- line, shape, value, format, texture-visual and tactile, type, color, and space, negative and positive.
    - Design principles, Balance- Symmetrical- Optical Centre, Unity, Emphasis, Contrast, rhythm, proportion and harmony.
    - Layout, definition, stages of layout, Visualization, Thumbnails, Rough layout and Comprehensive/final layout.

4. **Typography**

    - Measurements followed in typography- point and pica. Anatomy of types- x height, Ascender and descender, base line and body width. Parts of face arm, stroke, bracket, bowl, terminal, serif, hairline, count, stem and spine.
    - Type groups- sanserif, serif, novelty/decorative, black letter and roman old style, typeface, type front, type family, type style, modern typefaces, display types, true type and open type.
    - Importance of Legibility and Readability, Vector fronts and bitmapped fronts, Logos and trademarks

5. **Colour Dynamics and Colour Management**

    - Fundamentals of Colour, visible spectrum, primary, secondary and tertiary colours, subtractive colour and additive colour theory, process, spot colour/pantone, tint, shade and tones.

- Psychological effects of colours- warm and cool colours.
- Setting the environment for Colour works- Color Temperature.
- Colour Management and Needs- Targets of Print Colour Management, CIE Chromaticity Diagram- CIE Lab Values Spectrophotometry.
- Colour measuring instruments, Colorimetry and Densitometry- Densitometer, Spectrophotometer diagrams and functions.
- Profiles for Monitor, Scanner and Printer, International Colour Consortium- ICC Profiles, generating ICC profiles for monitor, Scanner and Printer, Device- independent CIE LAB colour space, rendering intents- perceptual, Relative, Absolute and saturation.

6. Page layout

- Style of house, style of work, grids, and columns, templates, master page, style sheet, caption, quotes, headers and footers, folio, headings, sub headlines and margins.
- Handling originals/photo- cropping, scaling and skewing.
- Imposition scheme- half sheet work, sheet work/work and turn, work and tumble and work and twist.
- Layout format for Magazine, Newspaper, and Bookwork.

7. Print publishing

- Dummy preparation, proof reading, proof reading marks, printers mark- crop, trim, bleed slug and registration, considerations for print production.
- Designing of other printed products- brochure, leaf, visiting card, invitation, booklet and folders.
- Feasibility of various graphic designing and pagination software (Photoshop, Illustrator, CorelDraw, Adobe In-design, Quark Xpress or FOSS) 5.4- Understanding file formats- TIFF, JPEG, PDF, GIF, EPS and PNG

8. Digital Prepress - Digital Photography & Digital Proofing

- Digital Description of the Printed page-Elements of Digital page-Integration of Text, Images, Graphics Layout and prepress checklist. dot Shape- Round, square, elliptical and composite shapes, Amplitude Modulation/frequency Modulation Screening- Difference between AM and FM screening and Benefits of FM screening.
- Input and Output Resolution-Scanning Frequency, Picture element and Scanning frequency formula. Image- dependent Effects and Corrections Spreads and Chokes, Trapping, Moire and interference of dot pattern.
- Under Colour Removal, Gray Component Replacement, and Unsharp Masking Techniques, Advantages of UCR, GCR & USM. Difference between UCR and GCR. Chromatic composition and achromatic composition.
- Image capturing with Digital camera- Special features of Digital Camera- Tone Value Quantization, Focal length of lens and Aspect ratio Link up to a Computer.
- Charge Coupled Device and Complementary Metal Oxide Semiconductor- Definition and difference between CCD and CMOS.
- Scanner design and models, Flat bed Scanners Diagram, functions of scanners and advantages of flatbed scanner.
- Digitizing and Redigitzing- Various Redigitizing Tecniques- Copy dot, Descreening and mixed mode. Digital Proofs and Press Proofs.

9. **Digital Image Assembly**

- Page Assembly and Imposition- Digital assembly, Data Formats techniques of CTF and CTP. Imposition – Image register and alignment, Imposition plans- sheet wise, Work and turn and Work and tumble
- Full Sheet Output , Full sheet production in the workflow, Imposition through Software and Full sheet production workflow.
- Imposition Workflows- Types of Imposition programs, Imposition sheet, demand on imposition programs and Imposition workflows and considerations for impositions.
- Raster Image Processor(RIP)- Workflow diagram- Interpreter, Renderer, demands on Imposition programs and Imposition workflows and considerations for impositions. And Bitmap. File Formats – Postscript, TIFF, JPEG, GIF, LZW, EPS, PDF, PPF,1 bit TIFF and JDF.
- Data Formats – Bitmap & Vector, Applications of storage media- Data distribution, Archiving and Backup or transport.

10. **Computer to Plates system**

- Types of Computer to plate System – Image register and Alignment, Types of CTPs, Advantage of CTP, Components of Computer to Plate system, Different Configuration of CTPs- Flatbed, Internal Drum and External Drum
- Workflows- PDF and JDF- portable Document Format, Job Defination Format and their advantages. Preflighting- Preflighting techniques, the process and preflighting checks.
- Computer to plate workflow, Types of LasersUV, Violet, Thermal and Computer to plate technology for flexography, gravure and screen printing processes.
- Printing plates for Digital Imaging- Types of plates used in CTP- Silver halide plates, photopolymer plates, Thermal plates, Inkjet plates Automatic plate processor diagram and its functions

11. **Paper**

- Raw materials for paper manufacture – Structures of Cellulose, Hemicellulose and Lignin
- Paper manufacture - Wood Pulping (mechanical and chemical),Bleaching, Refining, Internal Sizing, Effect of fillers to improve printability of paper, Colouring, Fourdrinier paper machine, Pressing, Drying, External Sizing, Coating, Calendering, Super calendering, Surface treatment of paper (paper reinforcement by polymer addition), Finishing (gloss and matte)
- Structural properties of paper - Grain, Two sidedness, Smoothness, Dimensional stability
- Paper grain direction and its importance in folding and binding
- Physical properties of paper - Basis weight, Paper caliper, Water absorbency, Ink receptivity, Surface smoothness, pH
- Strength properties of paper - Surface strength, Tensile strength, Bursting strength
- Optical properties of paper - Brightness, Whiteness, Opacity, Gloss, Metamerism
- Resistance properties of paper – Pick resistance, Tear resistance, Resistance to water, acid and alkali
- Paper runnability and Paper printability
- Paper characteristics required for news paper printing
- Paper characteristics required for package printing
- Printing problems related to paper

- Waste paper recycling

12. Packaging Materials

- Definition of packaging, Materials used for packaging- paper and paper boards, metals (tin and aluminium), films, foils, polymers (LDPE, HDPE, PP, PS, PVC)
- Properties of packaging materials and their application
- Selection of packing materials
- Importance and role of waxing, varnishing, laminating, foiling
- Laminates- double, triple
- Testing methods for different packages

13. Book Binding in Print Finishing

- Definition, General description of a book, classification of bookbinding & its operational divisions, main stages of Binding.
- Paper and its sizes – GSM, relation between GSM and weight of a ream, Estimation for paper, board, cloth calculations. Paper consideration – Size, Grain, Weight, Squaring & Singling.
- Styles of binding and covering materials.
- Use of different boards and adhesives. Binding equipment & tools.
- Cutting Machine – Single knife, three knives & five knives trimmer– Application of Air cushion table.
- End papers – definition, classification and its purpose.
- General layout of a Binding & Finishing Department Folding & Assembling the folded material
- Folding – Manual & Mechanical, Folding to print – Folding to paper, Right angle folding and parallel folding, knife folder, buckle folder, Former folder (for newspaper), Spiral folder (continuous binding stationery/business forms)
- Assembling the folded material for binding – Gathering, Collating, Inserting, – Manual and mechanical version.
- Stitching, Methods of using staplers or wire stitching machine, Sewing (Hand and Machine version), and classification of sewing, Adhesive/perfect binding loose leaf and mechanical binding.
- Case book binding work (Manual and Mechanical).
- Operational Sequences - Flush cut binding, Edition Binding, Library Binding, Account Book Binding, Re-binding – Prevention of Deterioration.

14. COSTING

- Variable Cost Names of Variable materials & services used in Printing Industries Semi – Variable Cost Name of the things included in Semi – Variable Costs in Printing Indirect Cost Names of the things included in Fixed Costs in Printing Industries
- Definition of Pricing Definition of Pricing Different factors of Pricing Brief overview on Bin Card, Job Ticket, Purchase Requisition
- Requisition and Depreciation Definition of Break – Even Point Algebrical & Graphical representation of Break – Even Point
- ESTIMATING Quality of a good Estimator Good Copy & Bad copy in Printing SPANKS method to find out ink coverage in Printing

- Casting Off calculation by En method Casting Off calculation by En method Calculation of Kg of a Ream for a known GSM and size of a stock and to estimate cost from it To find out the fixed cost of a machine for a known initial cost, interest%, depreciation%, insurance% etc.

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B.E. (COMPUTER SCIENCE) SYLLABUS

CSEB 101: COMPUTATIONAL MATHEMATICS – I (2L + 1T + 0P) (3 Cr)

Full Set Theory : Set and subsets, Empty set and power set, Equality of sets, operations on sets Cartesian Product of sets, Relations ,Domain and Range of a Relation, Equivalence relation, Equivalence classes, Functions, Special type of Functions (Injective, Surjective and Bijective), Identity function, composite Functions, Invertible Functions, Groups, Semi Group and Monoid, Subgroup, More characterizations of a Group, Rings, Some Special classes of Ring, Subring, Algebra of Subrings, Ideals and quotient rings, Properties of integral domains, Fields, Field of Fractions. Combinatories : Mathematical induction, Recurrence Relations, The Characteristic Polynomial, Generating Functions, The Principle of Inclusion-Exclusion, The Addition and Multiplication Rules, The Pigeon-Hole Principle, Permutations and Combinations. Mathematical Logic : Propositions, Connectives, Truth Table, Propositional Equivalence, Logical Equivalence, Tautologies, Predicates and Quantifiers, Negations. Linear Algebra : Characteristic Equations, Eigen Values and Eigen Vectors, Properties of Eigen Values, Cayley-Hamilton Theorem, Reduction to Diagonal form, Canonical forms.

CSEB102: BASIC ELECTRONICS (2L + 0T + 0P) (2Cr)

Full Physics of Semiconductor Devices: Conductivity, mobility, carrier lifetime, E-B diagram, Fermi level, effective mass, classification of semiconductors, P-N junction:Structure, operations and V-I characteristics built-in potential, forward and reverse biasing, different junction capacitances,different types of breakdown-Avalanche breakdown and Zener breakdown . Bipolar Junction Transistors (BJTs): Structures, mode of operation, different methods of biasing, hparameter analysis of transistors, amplifiers and oscillators circuit using BJTs, Field Effect Transistors (FETs): Structures of JFET and MOSFET, V-I characteristics, equivalent circuits, CMOS, MOS capacitors, Operational Amplifiers (Op-Amp): Basic building block, equivalent circuit, modes of operation,use of op-amp in inverting and non-invertible modes. gain-frequency response, use of op-amp in analog computation, 555 timer circuit and Schmitt trigger using op-amp,Design of astable and monostable multivibrator. Multivibrator circuits : Monostable, bistable and astable and their applications. Power Supply : Basic building block of a power supply, Regulated fixed and variable voltage supply, UPS, SMPS.Design of dc regulated power supply usin op-amp Electronic Measuring Equipment: Analog & digital multimeters, Cathode Ray Oscilloscope (CRO), signal generators.

CSEB 103: DATA STRUCTURE (3L + 1T + 0P) (3 Cr) Full

Data Structure and algorithm preliminaries: Definitions; Time and Space analysis of Algorithms; Time and space trade-off, Recursion,ADT Array: Definitions of Arrays and Lists; Stacks; Queues; Strings; Row/Column major representation of Arrays; Sparse matrix. Linked List: Singly linked list; circular linked list; doubly linked list, operations on linked list. Stack: Push; Pop; Applications of Stack; stack representation using array and linked list. Queue: Representation using array and linked list; Insertion and deletion operations; circular queue; priority queue. Graph Algorithms: Representation and Traversal, Basic Algorithms Minimal Spanning Tree, Shortest Path, All pairs Shortest Path, Transitive Closer Searching and Sorting Methods: Various Searching and Sorting algorithms with complexity analysis. Tree: Definition; Generalised tree representation; Binary tree - definitions and properties; binary tree traversal algorithms with and without recursion. Binary Search Tree - creation, insertion and deletion operations, Threaded tree (One way and Two way); AVL tree balancing; B-tree; Application of trees

CSEB 104: COMMUNICATION SKILL (2L + 0T + 0P) (2 Cr)

Full Basic Skills Development using English as medium; Listening skill :narrations and descriptions,taking notes,appropriate response.Speaking: Intelligent and Fluent way of making statements,reporting events. Reading texts. Writing sentences. Creative articles. Translation skills. Preparation of Presentation materials. Reference to modern day technological terminologies. Grammar :Familiarity with different types of sentences Preposition and their uses.Familiarity with Tenses Familiarity with degrees of objectives – Positive, Comparative, Superlative.Familiarity withCommon English idioms and everyday expressions.Common English group verbs and everyday expressions.Agreement of the subject with the verb. Salutations: Good Morning, Good day, Good Evening etc. and Modes of Address: e.g., Sir, Madam, Your Excellency, Tour Honour, Your Grace etc.Expression of a composite subject in one word e.g., An 'Entrepreneur' is a person who starts or organizes some 'Business'.Correction of sentences.Conversation with –Bus driver, taxi drivers etc.,At a telephone booth, railway station, airport etc.With a shop-keeper or a Chemist.With a doctor or with officials in a Bank.Mock interview for a Job.Mock Interview. Overall Revision.

CSEB 105: SYSTEMS PROGRAMMING (2L + 1T + 0P) (3 Cr)

Full System Hardware and Software :interaction Language Issues : Types and levels of languages; Interpretation and Translation; Translation of Low Level Languages and High Level Languages.: Characteristicsand differences Assemblers : Algorithm; Pseudo operations; Expressions. Debuggers, Word Processors, Editors . Tools : LEX and YACC/JavaCC Macro Processors; Recursive and nested macros. Linking and Loading Compilers : introduction..

CSEB 106: DIGITAL LOGIC (2L + 1T + 0P) (3 Cr)

Full Switching algebra and its applications, Boolean algebra vs. Switching algebra, Switching functions, Gate concepts, Minimization of switching functions, Universal logic module. Synthesis and Analysis of Logic Circuits, Two level and multilevel realizations, Propagation delay, Noise margin and Power dissipation, Switch and Inverter as functionally complete elements, Gates. Registers and Processor level design of Digital Systems, Structure and behavior components, Finite state model for Sequential circuits. Flip Flops, Synthesis of Sequential machines, Counters and Registers, Decompositions, Unitness and Symmetric Boolean functions. Threshold functions, Logic families, Static and Dynamic memories, Flash memories, PLA and PROM.

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M.SC. (PHYSICS) SYLLABUS

PT-101: MATHEMATICAL PHYSICS Vector algebra and vector calculus, linear independence, basis expansion, Schmidt orthogonalisation. Matrices: Representation of linear transformations and change of base; Eigen values and eigenvectors; Functions of a matrix; Cayley-Hamilton theorem; Commuting matrices with degenerate eigenvalues; Orthonormality of eigenvectors, Concepts of tensors (12)

UNIT II: Complex variables (12) Recapitulation: Complex numbers, triangular inequalities, Schwarz inequality. Function of a complex variable : single and multiple-valued function, limit and continuity; Differentiation; Cauchy-Riemann equations and their applications; Analytic and harmonic function; Complex integrals ,Cauchy's theorem (elementary proof only), converse of Cauchy's theorem, Cauchy's Integral Formula and its corollaries; Series - Taylor and Laurent expansion; Classification of singularities; Branch point and branch cut; Residue theorem and evaluation of some typical real integrals using this theorem.

UNIT III   Theory of second order linear homogeneous differential equations Singular points: regular and irregular singular points; Frobenius method; Fuch's theorem; Linear independence of solutions: Wronskian, second solution. Sturm-Liouville theory; Hermitian operators; Completeness. Inhomogeneous differential equations: Green's functions

UNIT IV Special functions (5) Basic properties (recurrence and orthogonality relations, series expansion) of Bessel, Legendre, Hermite and Laguerre functions., generating function Integral transforms (5) Fourier and Laplace transforms and their inverse transforms, Bromwich integral [use of partial fractions in calculating inverse Laplace transforms]; Transform of derivative and integral of a function; Solution of differential equations using integral transforms, Delta function. References:

1. Mathematical methods for physics, by G ARFEKEN

2. Matrices and Tensors for physicists, by A W JOSHI

3. Advanced engineering mathematics, by E KREYSZIG

4. Special functions , by E D RAINVILLE

5. Special functions by W W BELL

6. Mathematical method for physicists and engineers by K F REILYU, M P HOBSON

and S J BENCE

7. Mathematics for physicists, by MARY L BOAS

PT-102:CLASSICAL MECHANICS

Unit-I: Preliminaries, Newtonian mechanics of one and many particle systems conservation laws, work energy theorem, open system (with variable mass). Constraints and their classifications, D'Alembert's principle's, generalized coordinates, Lagrange equation.

Unit-II: Gyroscopic forces, dissipative systems, Jacobi integral, gauge invariance, generalized coordinates and momenta, integrals of motion, symmetry of space and time with conservation laws, invariance under Gallilean transformations.

Unit-III: Rotating frames, inertial frames, terrestrial and astronomical applications, Coriolis force. Central forces, definition and charactersitics, Two-body problem, closure and stability of circuler orbits, general analysis of orbits, Kepler's laws and equations, artificial satellites, Rutherford scattering.

Unit-IV: Principle of least action, derivation of equation of motion, variation and end points, Hamilton's principles and characteristics functions, Hamilton – Jaccobi equations. Canonical transformations, generating functions, properties, group properties, example's. Infinitesimal generators, Poison bracket ,Poison theorems, angular momentum PBs, small oscillations, normal modes and coordinates.

PT-103:QUANTUM MECHANICS - I

Unit-I: Why QM Revision; inadequacy of classical mechanics; Schrodinger equation; continuity equation; Ehrenfest theorem; Admissible wave functions; Stationary states, One dimensional problems, wells and barriers; Harmonic oscillators by Schrodinger Equation

Unit-II: Uncertainty relation of x and p, States with minimum uncertainty product; General Formalism of wave mechanics; Commutation Relations; Representation of states and dynamical variables; Completeness of eigen functions ; Dirac delta function ;Bra and ket Notation; Matrix representation of an operator ; Unitary transformation. Solution of Harmonic oscillator by operator method.

Unit-III: Angular momentum in QM; Central force problems: Solution of Schrodinger equation for spherically symmetric potentials; Hydrogen atom .

Unit-IV: Time independent perturbation theory; Non-degenerate and degenerate cases; Applications such as Stark effect etc.

PT-104 Basics of Electronic Devices

UNIT I Introduction to Electronic Materials, Energy bands, Fermi levels in intrinsic and doped semiconductors, degenerate semiconductors, derivation of intrinsic carrier concentration, carrier mobility and drift velocity, Resistivity and Conductivity, diffusion phenomenon, HaynesShockley experiment, Einstein's relationship, carrier injection & Direct band gap, recombination processes (direct)

UNIT II PN junction: thermal equilibrium condition, depletion region (abrupt and linearly graded junctions), depletion capacitance: C-V characteristics, impurity distribution, I-V characteristics; generation-recombination and high-injection effects, temperature effect, charge storage and transient behaviour; minority carrier storage, diffusion capacitance, junction breakdown: tunnelling effect and avalanche multiplication; semiconductor heterojunctions.

UNIT III Majority Carrier diodes Tunnel diode- principle of operation and V-I characteristics, Tunnel diode as circuit element, Backward diode- basic ideas, Schottky barrier diode- Formation of barrier, Basic ideas of Schottky Mott theory, Ohmic contacts and heterojunctions

Unit IV Other electronic devices: Electro-optic, Magneto-optic and Acousto-optic effects, Material properties related to get these effects, Important ferro electric, liquid crystal and polymeric materials for these devices, Piezoelectric, electrostrictive and magnetostrictive effects, important materials exhibiting these properties and their applications in sensors and actuator devices.

PT-105 Laboratory

1. Measurement of wavelength of He-Ne LASER (Grating)

2. Febry Perot Interferometer (demagnification factor)

3. To determine the Planck Constant and work function

4. Determination of speed of Ultrasonic wave in water

5. Photoconductivity (Photocurrent as a function of irradiance at constant voltage)

6. Design of regulated Power Supply

7. Study of Solar Cell characteristics

8. Study of the static drain characteristics of MOSFET

9. Verification of De Morgan's Theorem 10. IC-741 (Op-Amp)

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M.SC. (CHEMISTRY) SYLLABUS

1.   **Atomic Structure:** Heisenberg's uncertainty principle, Schrodinger wave equation (time independent); Interpretation of wave function, particle in one-dimensional box, quantum numbers, hydrogen atom wave functions; Shapes of s, p and d orbital's.

2.   **Chemical Bonding:** Ionic bond, characteristics of ionic compounds, lattice energy, Born-Haber cycle; covalent bond and its general characteristics, polarities of bonds in molecules and their dipole moments; Valence bond theory, concept of resonance and resonance energy; Molecular orbital theory (LCAO method); bonding in H_2^+, H_2, He_2^+ to Ne_2, NO, CO, HF, and CN^-; Comparison of valence bond and molecular orbital theories, bond order, bond strength and bond length.

3. **Solid State:** Crystal systems; Designation of crystal faces, lattice structures and unit cell; Bragg's law; X-ray diffraction by crystals; Close packing, radius ratio rules, calculation of some limiting radius ratio values; Structures of NaCl, ZnS, CsCl and CaF_2; Stoichiometric and nonstoichiometric defects, impurity defects, semi-conductors.

4. **The Gaseous State and Transport Phenomenon:** Equation of state for real gases, intermolecular interactions and critical phenomena and liquefaction of gases, Maxwell's distribution of speeds, intermolecular collisions, collisions on the wall and effusion; Thermal conductivity and viscosity of ideal gases.

5. **Liquid State:** Kelvin equation; Surface tension and surface energy, wetting and contact angle, interfacial tension and capillary action.

6. **Thermodynamics:** Work, heat and internal energy; first law of thermodynamics. Second law of thermodynamics; entropy as a state function, entropy changes in various processes, entropy-reversibility and irreversibility, Free energy functions; Thermodynamic equation of state; Maxwell relations; Temperature, volume and pressure dependence of U, H, A, G, Cp and Cv α and β; J-T effect and inversion temperature; criteria for equilibrium, relation between equilibrium constant and thermodynamic quantities; Nernstheat theorem, introductory idea of third law of thermodynamics.

7. **Phase Equilibria and Solutions:** Clausius-Clapeyron equation; phase diagram for a pure substance; phase equilibria in binary systems, partially miscible liquids-upper and lower critical solution temperatures; partial molar quantities, their significance and determination; excess thermodynamic functions and their determination.

8. Electrochemistry: Debye-Huckel theory of strong electrolytes and Debye-Huckel limiting Law for various equilibrium and transport properties. Galvanic cells, concentration cells; electrochemical series, measurement of e.m.f. of cells and its applications fuel cells and batteries. Processes at electrodes; double layer at the interface; rate of charge transfer, current density; overpotential; electro-analytical techniques: Polarography, amperometry, ion selective electrodes and their uses.

9. Chemical Kinetics: Differential and integral rate equations for zeroth, first, second and fractional order reactions; Rate equations involving reverse, parallel, consecutive and chain reactions; branching chain and explosions; effect of temperature and pressure on rate constant; Study of fast reactions by stop-flow and relaxation methods; Collisions and transition state theories.

10. Photochemistry: Absorption of light; decay of excited state by different routes; photochemical reactions between hydrogen and halogens and their quantum yields.

11. Surface Phenomena and Catalysis: Absorption from gases and solutions on solid adsorbents, Langmuir and B.E.T. adsorption isotherms; determination of surface area, characteristics and mechanism of reaction on heterogeneous catalysts.

12. Bio-inorganic Chemistry: Metal ions in biological systems and their role in ion transport across the membranes (molecular mechanism).

13. Coordination Compounds: (i) Bonding theories of metal complexes; Valence bond theory, crystal field theory and its modifications; applications of theories in the explanation of magnetism and electronic spectra of metal complexes. (ii) Isomerism in coordination compounds; IUPAC nomenclature of coordination compounds (iii) EAN rule, Synthesis structure and reactivity of metal carbonyls. (iv) Complexes with aromatic systems, synthesis, structure and bonding in metal olefin complexes, Compounds with metal-metal bonds and metal atom clusters.

14. Main Group Chemistry: Boranes, borazines, phosphazenes and cyclic phosphazene, silicates and silicones, Interhalogen compounds; Sulphur - nitrogen compounds, noble gas compounds.

15. General Chemistry of 'f' Block Elements: Lanthanides and actinides; separation, oxidation states, magnetic and spectral properties; lanthanide contraction.

16. Delocalised Covalent Bonding: Aromaticity, anti-aromaticity; annulenes, azulenes, tropolones, fulvenes, sydnones.

17. Preparation and Properties of Polymers: Organic polymers-polyethylene, polystyrene, polyvinyl chloride, teflon, nylon, terylene, synthetic and natural rubber.

18. Spectroscopy: Principle and applications in structure elucidation: IR Spetrometry, Nuclear Magnetic Resonance (1H NMR): Basic principle; chemical shift and spin-spin interaction and coupling constants, Mass Spectrometry: Parent peak, base peak, metastable peak.

19. Chemistry in Printing: Various Color combinations including CMYK, chemistry of inks, Preparation of all color Inks, Applications of various chemicals in Printing, Applications of chemistry in Printing.

(pages 01 to 17)

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