SYLLABUS OF SLIET ENTRANCE TEST (SET III)
FOR ADMISSION TO B.E. (Lateral Entry), 2024

PATTERN OF SET III

SLIET Entrance Test (SET-III) for admission to B.E. (Lateral Entry) will consist of one paper of two hours duration. This paper will have 120 objective type questions of 120 marks from English, General Knowledge, Mental Aptitude, Mathematics, Physics, Chemistry and Basics of Engineering (**appropriate group**).

Note: The Examination will be conducted in CBT mode only. There will be 25% negative marking for wrong answers.

SYLLABUS AND MODEL QUESTIONS

Marks: 120   **Time:2 Hours**

GENERAL KNOWLEDGE, MENTAL APTITUDE & ENGLISH

Marks: 15 (15 Questions)
Syllabus:
The paper will include questions covering the following topics:-

1. General Science
2. Current events of National and International importance
3. History of India
4. Indian Politics and Economy
5. Indian National Movement
6. General Mental ability
7. Idioms/Phrases
8. Usage of Tenses
9. Change the form of Narration
10. Fill in the blanks with suitable words.

MATHEMATICS

Marks: 15 (15 Questions)

Algebra: Solution of quadratic equations, relationship between their roots and coefficients. Equations reducible to quadratic equation. Symmetric Functions of roots. Formation of a quadratic equation with given roots. Arithmetic progression, Geometric progression and Arithmetico-Geometric series. Series of natural numbers ($\sum n, \sum n^2, \sum n^3$). Mathematical induction. Permutations and Combinations. Binomial theorem for any index.

Trigonometry: Trigonometric Identities. Addition and Subtraction formulae. Transformation of product into sum or difference and vice-versa. T-ratios of multiple and sub-multiple angles. Heights and distances. Solution of Trigonometric Equations. Inverse trigonometric functions and their properties.

Coordinate Geometry: Rectangular Cartesian coordinates. Distance between two points. Section formulae. Locus of a point. Equation of a straight line in various forms. Angle between two given lines. Condition for two lines to be parallel or perpendicular. Distance of a point from a line. Line through point of inter section of two given lines. Concurrency of lines. Equation of a circle in various forms. Intersection of a circle with a straight line. Equations of the parabola, ellipse and hyper bola in the standard forms.

Three dimensional Geometry: Cartesian co-ordinate system, Distance formula, Section formula, Direction ratios and direction cosines, Equation of a plane, Equations of a Straight line.

Calculus: Function, its domain and range. Limit, continuity and differentiability of a function. Derivative of sum, difference, product and quotient of two functions. Derivative of algebraic, trigonometric, exponential, logarithmic, hyperbolic and Inverse trigonometric functions. Chain rule. Derivative of functions expressed in implicit and parametric forms. Maxima & Minima.

Equation of tangent and normal. Integration as the inverse process of differentiation. Integration by parts, by substitution and by partial fractions. Integration of rational and irrational functions. Definite integral and its application for the determination of area (simple cases).

Differential Equations: Order and degree of an ordinary differential equation, Ordinary differential equations of first order and first degree. Solution- variable-separable method, homogeneous differential equations and linear equation's (Leibnitz's).

Matrices and Determinants: Types of matrices, operations of matrices, elementary operations on matrices, determinants and their properties, Inverse of a matrix, solution of linear equations up to three variables by Cramer's rule and by Matrix method.

Statistics: A.M, Median, Mode, Range, S.d. and Coefficient of variation.

CHEMISTRY

Marks: 10(10 Questions)

Atoms, Molecules and Chemical Arithmetic: Symbols, formulae, oxidation, reduction, oxidation number, balancing of simple chemical equations, mole concept, empirical formulae and molecular formulae.

Chemical families – Periodic Properties: Mendeleev's and Modern periodic tables, classification of elements into s,p,d and f blocks, periodic properties (ionization potential, electron affinity, atomic and ionic radii, oxidation states).

Atomic Structure, Bonding and Molecular Structure: Bohr's theory, brief description of hydrogen spectrum, the wave nature of matter, de-Broglie's theory, Uncertainty principle, Quantum numbers, Pauli's exclusion principle, Hund's rule of maximum multiplicity, shapes of orbitals, electronic configuration of atoms up to atomic no.30.Types of bonding (ionic, covalent and co-ordinate), Lewis structure, VSEPR theory, hybridization, Molecular orbital theory and molecular shapes, hybridization ($sp3d$, $sp3d2$ and sp^3) and molecular structure, hydrogen bond, metallic bond, Vander Waals forces.

PHYSICS

Marks: 10 (10 Questions)

- **Motion:** Introduction to Motion, Types of Motion (Translational, Rotational, Oscillatory), Scalars and Vectors, Graphical Analysis of Motion, Projectile, Circular Motion, Newton's Laws of Motion, Forces and Free Body Diagrams, Frictional Forces, Tension and Normal Forces, Energy and Power, Potential Energy and Conservation of Mechanical Energy, Momentum and Collisions, Angular Displacement, Moment of Inertia, Torque and Rotational Dynamics.

- **Oscillation and Wave:** Definition of Oscillation, Types of Oscillatory Motion (Simple Harmonic Motion, Damped Oscillations, Forced Oscillations), Period, Frequency, Amplitude and Phase, Simple Harmonic Motion (SHM), Equations of Motion for SHM, Energy in SHM (Kinetic and Potential), Damped and Forced Oscillations, Critical Damping, Underdamping, and Overdamping, Resonance, Applications of Forced Oscillations
Waves: Basics and Properties of Waves, Types of Waves (Mechanical, Electromagnetic), Characteristics of Waves (Amplitude, Wavelength, Frequency), Wave Equation, Transverse and Longitudinal Waves, Wave Speed and Phase Velocity, Superposition Principle, Interference and Beats.

- **Properties of Matter:** Mechanical Properties of Solids: Stress and Strain, Elasticity and Plasticity, Hooke's Law, Young's Modulus and Shear Modulus; Fluid Mechanics: Properties of Fluids (Density, Pressure), Pascal's Law, Archimedes' Principle, Bernoulli's Principle; Thermal Properties of Matter: Temperature and Heat, Specific Heat Capacity, Thermal Expansion, Heat Transfer Mechanisms (Conduction, Convection, Radiation)

- **Semiconductor Physics:** Introduction to Semiconductor Physics, Intrinsic and Extrinsic Semiconductors, Energy Bands in Solids, Silicon and Germanium as Semiconductor Materials, Doping and Impurities, p-n Junction Formation, Diode Characteristics and Working, Biasing of Diodes (Forward and Reverse Bias), Diode Applications: Rectification, Zener Diodes.

- **Modern Physics:** Introduction to Modern Physics, Quantum Mechanics: Wave-Particle Duality, Photoelectric Effect, de Broglie Wavelength, Davisson-Germer Experiment, Heisenberg's Uncertainty Principle, Development of Schrödinger Equation and its Solutions, Quantum States and Wave functions, Probability Interpretation, Quantum Numbers (Principal, Angular Momentum, Magnetic), Quantum Tunneling; Nuclear Physics: Structure of the Nucleus, Radioactivity and Decay, Nuclear Fission and Fusion.

Reference Books:
- "Physics" by Resnick, Halliday, and Krane
- "Fundamentals of Physics" by David Halliday, Robert Resnick, and Jearl Walker

- "University Physics with Modern Physics" by Hugh D. Young and Roger A. Freedman
- "Waves and Oscillations: A Prelude to Quantum Mechanics" by Walter Fox Smith
- "Mechanics of Materials" by Russell C. Hibbeler
- "Fluid Mechanics" by Frank M. White
- "Thermal Physics" by Charles Kittel and Herbert Kroemer
- "Solid State Electronic Devices" by Ben G. Streetman and Sanjay Banerjee
- "Semiconductor Physics and Devices" by Donald A. Neamen
- "Physics of Semiconductor Devices" by Simon M. Sze and Kwok K. Ng
- "Modern Physics" by Kenneth S. Krane
- "Introduction to Nuclear and Particle Physics" by A Das and T Ferbel

BASICS OF ENGINEERING
GROUP –A (Electrical, Electronics and Computer Group)

Marks: 70 (70 Questions)

Operating System: Introduction to various operating systems, single user, multiuser, batch processing, time sharing, real time, multiprogramming and multiprocessing systems, distributed computing, resources management, memory management.

System Software: Introduction, system software, application software, compilers, assemblers, loaders, linkers.

Application Development: Algorithms and flowcharts, program writing, debugging and execution, compilation, interpretation, programming using C language, Object Oriented Programming concepts.

Information Technology (IT): Internet and its applications, web browser, e-mail, e-marketing & e-payment.

Data management and organization: Introduction to databases, architecture and structure of DBMS, data models.

Introduction to data structure: arrays, linked list, stacks and queues.

Computer Networks: Applications, introduction to OSI and TCP/IP, networking topologies/technologies.

Latest Technologies: Latest processor and memory configurations and related technologies.

Software Engineering: Software development life cycle, software metrics, coding and testing.

Computer System Architecture: Number system, boolean algebra, K-map, instruction formats, addressing modes, I/O interfacing, control unit organization, pipelining, cache and main memory, modes of data transfer.

Cloud Computing: Introduction to cloud computing, edge computing, fog computing and IOT.

Electronic Devices: Conductors, semiconductors, insulators, extrinsic & intrinsic semiconductors. PN junction diode- its V-I characteristics, rectifiers, filters. BJT-various transistor configurations, their input/output characteristics, FET, MOSFET their construction & characteristics.

Communication: Need & types of modulation (AM, FM, PM), radio receivers-TRF & super-heterodyne, pulse modulation PAM, PCM, PWM, PPM.

Logic gates: Definition, symbols & truth table of NOR, OR, AND, NAND, EX-OR gates, various flip flops (SR, JK, T, D), registers & counters.

Operational Amplifier: Introduction, IC 741 pin configuration, inverting & non inverting amplifiers, op amp as an inverter, scale changer, adder, sub-tractor, differentiator, integrator.

Electric Circuits: Voltage, current, resistance, power and energy, ohm law, series and parallel circuits, network theorems (thevenins, superposition, norton, maximum power transfer theorem, reciprocity and tellegen's theorems), alternating current and voltage, RL, RC and RLC circuits, RLC resonant circuits, power factor and power measurement.

Electromagnetic & Magnetic circuits: Overview of electrical and magnetic circuit, analogy between electrical and magnetic circuits, principle of operation and working of AC &DC machines and transformers.

Measurement and Instrumentation: Errors in measurement system, galvanometer, PMMC and moving iron instruments, DC potentiometers, Multimeter, LED/LCD/Segment Displays, CRO, Wheatstone bridge, Maxwell's Bridge, De-Sauty's Bridge, Owen's Bridge, Kelvin's Double Bridge, Hay's Bridge.

Sensors and Signal Conditioning: Basic components of instrumentation system, sensors and transducers, resistive, capacitive and inductive and piezoelectric transducers, A/D and D/A converters, filtering and impedance matching, telemetry.

Control Engineering: Basic elements of feedback control system, time domain response of first and second order system, time and frequency domain specifications, concept of stability.

GROUP – B (Mechanical Group)

Marks: 70 (70 Questions)

Thermal Engineering: Basic concepts, thermodynamic properties: intrinsic and extrinsic, open, closed and isolated systems, heat and work, specific heat, thermal and thermodynamic equilibrium, Zeroth law and first law of thermodynamics, internal energy, entropy, enthalpy. Clausius and Kelvin-Plank statement of second law, different thermodynamic processes like isobaric, isochoric, isothermal, and reversible adiabatic, C.I. engine, S.I. engine, Otto Cycle, Diesel Cycle, Carnot Cycle, Steam Formation: Dry, Wet Steam, Dryness Fraction

Applied Mechanics, Strength of Material and Machine Design: Concept of mechanics and applied mechanics, laws of forces, moments, friction and laws of motion. Stress & strain, concept of load, tensile, compressive, shear stress, torsion, Bending Moments and strains. Columns, Springs, Beams, stress concentration, types of loading, theories of failure, factor of safety, endurance limit, efficiency of riveted and welded joints, keys and its types, stress in shafts, design of shafts (solid and hollow).

Fluid Mechanics: Concept of fluid, fluid mechanics and hydraulics, properties of fluid (viscosity, specific weight, specific volume, specific gravity) with their units. Pascal's law, concept of atmospheric pressure, gauge pressure, absolute pressure, vacuum and differential pressure, Buoyancy, Centre of Buoyancy, Metacentre, Metacentre Height and Application.

Manufacturing Engineering & Management: Introduction and classification of engineering materials, thermal, chemical, electrical and mechanical properties of commonly used engineering materials. Purpose of heat treatment, various heat treatment processes like cyaniding, nitriding, hardening, case hardening, annealing, normalizing, tempering, and their applications. Arc and gas welding processes, pattern materials and pattern allowances used in pattern making, cores, basic foundry processes and powder metallurgy. Different machining operations, principles of operations, cutting tools and machine tools used to carryout turning, milling, drilling, shaping & planning operations. Quality control, control charts, acceptance sampling, TQM. Plant location, layout and line balancing. Types of plant layouts. Inventory control, Inventory classification, and EOQ and ABC analysis.

GROUP – C (Chemical and Food Group)

Marks: 70 (70 Questions)

Chemical Engineering Thermodynamics: Laws of Thermodynamics, Thermodynamic properties ,General Thermodynamic relationship, Application for open/closed systems and reversible/irreversible processes, Raoult's Law, Chemical Reaction Equilibria.

Chemical Reaction Engineering: Molecularity and order of reaction, reaction Kinetics, different type of ideal reactors and their performance equations,

Heat and mass Transfer: Different modes of heat transfer with governing relationships, Fourier's law, Steady state heat transfer through plain and composite slab, cylindrical and spherical surfaces, Natural and forced convection, Radiation heat transfer, Heat transfer equipment's and their industrial applications, Fick's law of diffusion, Mass transfer operations and their applications, Critical moisture content, absorption, equipment for separation and industrial application.

Unit Operations: Calculation of energy required in grinding by Ritinger's law and bond's law, Bernoulli's theorem and different regimes, elementary knowledge of pumps and fluid behavior, Mixing index, Rate of mixing, agitation, constant rate filtration, consent pressure filtration, filter cake compressibility, Centrifuge equipment like cream separator and clarifiers used in dairy industry, Crystallization.

Process Instrumentation: Instruments for temperature, pressure, liquid level, flow and pH measurement.

Environmental Studies: Human population growth and environmental challenge, deforestation, desertification, global warming and climate change, role of individual in environmental conservation, Equitable use of resources, overutilization and wasteful utilization of natural resources, conservation of wildlife and biodiversity, Vehicular pollution, industrial pollution, municipal wastes, noise pollution, introductory ideas of water and air pollution control, Nuclear hazards, water act, air act, forest conservation act.

Food Chemistry and Microbiology: Classification, Physical and chemical properties of carbohydrates, proteins, lipids, type of

pigments, vitamins and minerals, morphology, methods of reproduction and type of bacteria and fungi, microbiology of various food products.

Food Process Technology: Milling of cereals and pulses, oil extraction methods, standardization, homogenization and pasteurization of liquid milk, meat and poultry processing, production of alcoholic and non-alcoholic beverages, technology of manufacturing of fruits and vegetables product, different preservation techniques in food.

Food Analysis and Quality Control: Quality attributes, food adulteration and its detection, physico -chemical and mechanical properties of food, sensory evaluation, HACCP, food safety and standards Act.

Objective Type Questions

Fill the choice of the alternative you think to be correct answer in the OMR answer sheet.

Q1.   A ball thrown up is caught by the thrower 4s after start. The height to which the ball has risen is

(assuming g=10m/s^2)

   (a) 20m   (b) 10m   (c) 400m   (d) 2m

Q2.   What determines the nature of path followed by the particle?

   (a) speed   (b) velocity   (c) acceleration   (d) none of these