Syllabus (for Entrance)

Paper 1

a) PHYSICS

MECHANICS :

Unit and dimensions, displacement, velocity, acceleration, kinematics in one and two dimensions, projectiles, circular motion, concept of relative motion.

Newton's laws of motion, concepts of inertial and uniformly accelerated frames. Force, spring force, frictional force, and gravitational force. Work, energy and power, momentum, conservation of momentum and energy. Linear and angular momentum, simple harmonic motion.

Universal law of gravitation, gravitational potential and field, acceleration due to gravity, motion of planets and satellites in circular orbits, Kepler's laws.

System of particles, Center of mass and its motion, elastic and inelastic collisions. Rigid bodies, moment of inertia, parallel and perpendicular axes theorems, moment of inertia of simple geometrical shapes, i.e. uniform ring, disc, thin rod, cylinder. Angular momentum, its conservation, torque, equilibrium of rigid bodies.

Hook's law; Young's shear and bulk modulus. Principle of buoyancy, pressure in fluid, streamlined flow, Bernoulli's theorem.

Wave motion, concepts of amplitude, frequency and phase. Longitudinal and transverse waves, superposition of waves, progressive and stationary waves. Vibration of strings and air columns, resonance, beats, velocity of sound echo, Doppler effect.

HEAT AND THERMODYNAMICS :

Thermal expansion of solids, liquids and gases, ideal gas laws, absolute temperature, specific heats and their ratio, Isothermal and adiabatic processes. First law of thermodynamics. Calorimetry, latent heat, equivalence of heat and work, Heat conduction in one dimension, convection and elementary concepts of radiation. Stefan's law of radiation. Wien's displacement law, Newton's law of cooling. Elements of the kinetic theory of gases. Pressure and temperature of an ideal gas.

ELECTROSTATICS :

Coulomb's Law, electric field and electric potential, lines of force, capacitance, dielectric constant, parallel plate capacitor, capacitors in series and parallel. Energy stored in capacitor, charging and discharging of capacitor.

CURRENT ELECTRICITY :

Electric current, Ohm's law, series and parallel arrangements of resistance's and cells. Kirchoff's laws and applications to networks. Heating effect of current. Biot-Savart's law, force on a moving charge and on a current carrying wire in a magnetic field, magnetic moment of a current loop, effect of a uniform magnetic field on a current loop, moving coil galvanometer, voltmeter, ammeter. Growth and decay of current in L-R and C-R circuits. Electromagnetic induction, Faraday's law, Lenz's law, definitions of self and mutual inductance. A. C Generator, LCR circuit with A.C. Phasor diagrams and L-C oscillations.

OPTICS :

Rectilinear propagation of light, light reflection and refraction at plane and curved surfaces. Total internal reflection and critical angle. Deviation and dispersion of light by a prism. Thin lenses, Spherical aberration, microscope, telescope.

Wave nature of light, interference. Young's double slit experiment, fringe width, elementary concepts of diffraction by a single slit.

ATOMIC AND NUCLEAR PHYSICS :

Radioactivity : alpha, beta and gamma radiations, law of radioactive decay, decay constant, half- life and mean life Photoelectric effect. de-Broglie wavelength, Bohr's theory of hydrogen- like atoms. Production of characteristic and continuous X-ray. Atomic nucleus, binding energy and its calculation. Fission and fusion processes, energy calculation in these processes.

SEMICONDUCTOR PHYSICS AND ELECTRONICS :

Elementary concepts of metals. Insulators and semiconductors, Intrinsic and extrinsic semiconductors, p-n junction as an amplifier (in common emitter mode) and an oscillator with quantitative applications.

b) MATHEMATICS

ALGEBRA :

Algebra of complex numbers, modulus and argument, triangle inequality, nth roots of unity. Theory of quadratic equations and quadratic expressions, relationship between the roots and coefficients, sign of a quadratic expression, greatest and least values of

quadratic expression. Arithmetic geometric and harmonic progressions, sums of arithmetic, geometric and harmonic progressions, infinite geometric series, sums of the squares and cubes of the first n natural numbers. Mathematical induction, permutations and combinations, Binomial theorem for a positive integral index. Determinants of order two and three, solutions of simultaneous linear equations in two and three variables.

TRIGONOMETRY :

Trigonometric functions and their graphs, addition and subtraction formulae, formula involving multiple and sub multiple angles, general solution of trigonometric equations, relations between the sides and angles of triangle, properties of a triangle, solutions of triangles, heights and distances, trigonometric functions.

ANALYTICAL GEOMETRY OF TWO DIMENSIONS :

Equation of straight line in various forms, angle between tow lines, distance of a point from a line, line through the point of intersection of two given lines, concurrency of lines. Equation of a circle in various forms, equations of tangent and normal, intersection of a circle with a straight line, equation of a circle through the points of intersection of two circles and that of a circle and a straight, line. Equations of the conic sections in the standard form, focus, directrix, eccentricity of the conic section, parametric equations, equations of tangent and normal

CALCULUS :

Into, onto and one-to-one functions, Sum, difference, product and quotient of two functions, composite function; absolute value, greatest integer, polynomial, rational, trigonometric, exponential and logarithmic functions, even and odd functions, inverse of a function. Limit and continuity of a function, limit and continuity of the sum, difference, product and quotient of two functions, continuity of composite function. Derivative of a function, derivative of composite and implicit functions, derivatives of polynomial, rational, trigonometric, inverse trigonometric, exponential and logarithmic functions. Geometrical interpretation of derivative, tangents and normal. Monotonicity, maximum and minimum values of a function. Derivatives upto order three.

INTEGRATION, DIFFERENTIAL EQUATIONS :

Integration as the inverse proves of differentiation, integration by parts, integration by the methods of substitution and partial fraction, Definite integral and its application for the determination of areas. Properties of definite integrals. Formational of differential

equations. First order equation, variables separable and homogeneous equations.

PROBABILITY :

Addition and multiplication laws of probabilities, conditional probabilities.

VECTORS :

Addition and vectors, scalar products, cross product, scalar and vector triple products, applications in geometry.

PAPER 2

a) APTITUDE TEST

It will consist of analytical and logical reasoning.

b) GENERAL KNOWLEDGE

It will consist of General Knowledge related to Information Technology.

c) ENGLISH

It will consist of English (language) to test the communication skills of candidates.