SYLLABUS FOR GSAT-2019 ENTRANCE TEST
M.Sc. PHYSICS
Test Code No: 102P

SECTION-A **(20 bits: 20 marks)**

1. Mechanics of rigid bodies:Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Eulers equation, precession of a top, Gyroscope, precession of the equinoxes

2. Central forces:Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws, Coriolis force and its expressions.

3. Ultrasonics: Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Velocity of ultrasonics in liquids by Sear's method. Applications of ultrasonic waves.

SECTION-B **(25 bits: 25 marks)**

4. Thermodynamics: Introduction – Reversible and irreversible processes – Carnot's engine and its efficiency – Carnot's theorem – Second law of thermodynamics, Kelvin's and Claussius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.

5. Quantum theory of radiation: Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of radiation - Planck's law – deduction of Wein's law, Rayleigh-Jeans law, from Planck's law - Measurement of radiation – Types of pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

6. Optics: Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light. Interference by division of wave front. Interference by division of amplitude. Introduction – Distinction between Fresnel and Fraunhoffer diffraction. Resolving Power of grating. Methods of Polarization, Polarizatioin by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewsters law – Malus law – Nicol prism polarizer and analyzer.

7. Laser & Fiber Optics: Lasers: Introduction – Spontaneous emission – Stimulated emission – Population inversion . Laser principle – Einstein coefficients – Types of Lasers – He-Ne laser – Ruby laser – Applications of lasers. Fiber Optics : Introduction – Optical fibers – Types of optical fibers – Step and graded index fibers.

SECTION-C **(15 bits : 15 marks)**

8. Dielectrics: An atomic view of dielectrics, potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium– Relation between D,E, and P. Dielectric constant, susceptibility and relation between them. Boundary conditions at the dielectric surface. Electric fields in cavities of a dielectric-needle shaped cavity and disc shaped cavity.

9. Moving charge in electric and magnetic field: Hall effect, cyclotron, synchrocyclotron and synchrotron – force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot –Savart's law and calculation of B due to long straight wire, a circular current loop and solenoid.

10. Electromagnetic induction: Faraday's law –Lenz's law – expression for induced emf – time varying magnetic fields – Betatron –Ballistic galvanometer – theory – damping correction – self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid – toroid – energy stored in magnetic field – transformer – Construction, working, energy losses and efficiency.

Model Questions:

Answer all questions: **1x60=60 Marks**

1. Hall effect determines

(A) Sign of charges (B) Voltage (C) Current (D) loss of energy

2. Double refraction occurs due to

(A) Change in media (B) Change in frequency
(C) Refraction (D) None of these