

RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF LECTURER IN PHYSICS FOR TECHNICAL EDUCATION DEPARTMENT

PAPER-I

I. Electromagnetic Theory and Optics-

Electrostatics: Gauss's Law and its applications; Laplace and Poisson equations, boundary value problems; Magnetostatics: Biot-Savart law, Ampere's theorem, electromagnetic induction; Maxwell's equations in free space and linear isotropic media; boundary conditions on fields at interfaces; Scalar and vector potentials; Gauge invariance; Electromagnetic waves in free space, dielectrics, and conductors; Reflection and refraction, polarization, Fresnel's Law, interference, coherence, and diffraction; Dispersion relations in plasma; Dynamics of charged particles in static and uniform electromagnetic fields; Radiation from moving charges, dipoles and retarded potentials, General theory of Image formation, Cardinal points, Thick and Thin lenses, Microscope and Telescope, Interference of light, Haidinger fringes, Fresnel and Fraunhofer diffraction, Resolving power, Polarization of light, Production and analysis of Polarized light.

II. Electronics-

Physics of P-N junction, Diode as a circuit element, clipping and clamping, Rectification, Zener regulated power supply Transistor as a circuit element, CC, CB and CE configuration, Transistor as a switch, Feedback in amplifiers, Oscillators, FET, MOSFET and their applications, Operational amplifiers and its applications, inverting and non-inverting amplifiers, adder, integrator differentiator, wave form generator, multivibrators, comparator, Schmidt trigger. Boolean algebra, Digital integrated circuits: Logic gates, NAND and NOR gates as building blocks, X-OR gate, Half and Full adder circuits, Karnaugh map, Flip – Flops, counters and registers.

III. Circuit Analysis-

Energy sources, Active and Passive elements, Kirchhoff's laws and their applications. Four terminal networks, Z, Y and h parameters, Thevenin's and Norton's Theorem, Maximum Power Transfer

Theorem, Superposition Theorem, Reciprocity Theorem, Miller Theorem, T and PI Network, Mean and rms values in AC circuits. LR, CR and LCR circuits- series and parallel resonance. Quality factor. Principal of transformer.

IV. Atomic & Molecular Physics-

Quantum states of an electron in an atom; Electron spin; Stern-Gerlach experiment; Spectrum of Hydrogen, helium and alkali atoms; Relativistic corrections for energy levels of hydrogen; Hyperfine structure and isotopic shift; width of spectral lines; LS & JJ coupling; Zeeman, Paschen Back & Stark effect; X-ray spectroscopy; Electron spin resonance, Nuclear magnetic resonance, chemical shift; Rotational, vibrational, electronic, and Raman spectra of diatomic molecules; Frank–Condon principle and selection rules; Spontaneous and stimulated emission, Einstein A & B coefficients; Lasers, optical pumping, population inversion, rate equation.

V. Condensed Matter Physics-

Crystal structure, Miller Indices, Bravais lattices; Reciprocal lattice, diffraction and the structure factor; Bonding of solids; Elastic properties, phonons, lattice specific heat; Free electron theory and electronic specific heat; Einstein and Debye model, Response and relaxation phenomena; Drude model of electrical and thermal conductivity; Boltzman transport equation, Sommerfield theory of electrical conductivity, Mathiessen's rule, Hall effect and thermoelectric power; Origin of Atomic Magnetism, Diamagnetism, paramagnetism, and ferromagnetism; Electron motion in a periodic potential, band theory of metals, Kronig-Penny model, Effective mass, concept of holes, insulators and semiconductors; Superconductivity, type – I and type - II superconductors, BCS theory, DC and AC Josephson Effects, Semiconductor: laws of mass action, Impurity conductivity, Photo conductivity and Photo luminescence.`

Note :- **Pattern of Question Paper**

- 1. Objective type paper**
- 2. Maximum Marks: 75**
- 3. Number of Questions: 150**
- 4. Duration of Paper: Three Hours**
- 5. All questions carry equal marks.**
- 6. There will be Negative Marking.**
- 7. Medium of Competitive Exam: Bilingual in English & Hindi.**