

# **RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER**

## **SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF LECTURER IN PHYSICS FOR COLLEGE EDUCATION DEPARTMENT**

### **PAPER-I**

#### **I. Electromagnetic Theory**

Electrostatics: Gauss' 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; Lorentz invariance of Maxwell's equations; Dynamics of charged particles in static and uniform electromagnetic fields; Radiation from moving charges, dipoles and retarded potentials.

#### **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. Operational amplifiers and its applications, inverting and non-inverting amplifiers, adder, integrator differentiator, wave form generator, multivibrators, comparator, Schmidt trigger. Digital integrated circuits : NAND and NOR gates as building blocks, X-OR gate, Half and Full adder circuits Flip – Flops, counters and registers.

#### **III: Circuit Analysis**

Kirchhoff's laws and their applications. Thevenin's and Norton's Theorem, Maximum Power Transfer Theorem, Superposition 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**

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; Response and relaxation phenomena; Drude model of electrical and thermal conductivity; Hall effect and thermoelectric power; Diamagnetism, paramagnetism, and ferromagnetism; Electron motion in a periodic potential, band theory of metals, insulators and semiconductors; Superconductivity, type – I and type - II superconductors, Josephson junctions.

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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.**