

# **RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER**

## **SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF LECTURER IN MECHANICAL ENGINEERING FOR TECHNICAL EDUCATION DEPARTMENT**

### **PAPER – II**

#### **1. Thermodynamics:**

Thermodynamic systems and processes, Zeroth law of thermodynamics, Properties of pure substances, First law of thermodynamics applied to closed and open systems, Second law of thermodynamics and their applications, Carnot, Otto, Diesel and Dual cycles, Properties of steam, Vapour power cycles like Rankine, modified Rankine and Reheat cycle, Regenerative cycle.

#### **2. Heat Transfer:**

Conduction: One- dimensional steady state heat conduction, Heat conduction through composite walls, Critical thickness of insulation, Heat transfer from finned surfaces, fin efficiency and effectiveness. Convection: Free and forced convection, Dimensional analysis, Heat transfer correlations, Hydrodynamic and thermal boundary layers, boundary layer equations and their solutions for flat plates and pipes. Radiation: Planck's distribution law, Radiation properties, Kirchoff's law, diffuse radiation, Lambert's law, Intensity of radiation, Heat exchange between two black surfaces, Heat exchange between gray surfaces, radiation shield, Electrical analogy. Boiling and Condensation: different regimes of boiling heat transfer, Correlations of boiling heat transfer, Film wise and Drop wise condensation.

Heat Exchangers: Different types of heat exchangers, Logarithmic mean temperature difference and effectiveness for parallel flow and counter flow heat exchangers, Correction factor and fouling factor, Heat exchanger design by LMTD and effectiveness NTU methods.

#### **3. Thermal Energy Conversion:**

Introduction to S.I. and C.I. Engines, Performance parameters, Gas turbine, simple cycle, Steam Nozzle, Steam turbine, Velocity diagram.

#### **4. Environmental Engineering:**

Refrigeration cycle, Vapour compression and Vapour absorption cycle, Properties of important Refrigerants, Psychrometric process, Application of Air conditioning, Human comfort.

## **5. Automobile Engineering:**

Transmission System– Clutch, Gear-box, Propeller shaft, Differential, brakes, Braking system, Steering system, Air pollution by Automobile Engines and its controls, Suspension system, Aerodynamic design of vehicle body, various safety features, Fuel system.

## **6. Power Plant Engineering:**

Layout and working principles of Thermal, Hydraulic, Gas and Nuclear power plants, power plant. Wind power Plants, Solar power plants and other unconventional sources of power, Power plant economics, Fuel cell technology.

## **7. Fluid Mechanics:**

Basic definitions and fluid properties, differential equations of continuity and momentum, manometry, buoyancy, forces on submerged bodies, stability of floating bodies, Bernoulli's theorem, Flow through pipes, Laminar and Turbulent flow, Boundary layer and its control, Measurement of flow by Venturi meter, V-notch and Pitot tube, Dimensional analysis, Drag and Lift.

## **8. Fluid Machines:**

Impulse and reaction turbines, Pelton, Francis and Kaplan turbine, their construction, performance and characteristics, specific speed, governing systems, draft tubes, Axial, Centrifugal and Reciprocating compressors and pumps, Cavitation in pumps, Selection of Pumps and Turbines.

\*\*\*\*\*

### **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. Medium of Competitive Exam : English**
- 7. There will be Negative Marking.**