RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS OF COMPETITIVE EXAMINATION FOR THE POST OF INSPECTOR OF FACTORIES & BOILERS (FACTORIES & BOILERS INSPECTION DEPARTMENT) (Dated 26-12-2025)

1. **THERMODYNAMICS:** Thermodynamic systems and processes and their heat & work analysis, laws of thermodynamics, flow and non-flow processes, ideal and real gases, entropy, reversible and irreversible processes, availability, Otto, Diesel, Dual and Brayton cycle.

2. **INTERNAL COMBUSTION ENGINES:** Classification of I.C. engines, two and four stroke engines, combustion in S.I. and C.I. engines, fuel supply systems, ignition systems, lubrication systems, cooling systems, performance parameters and their analysis, air pollution: causes and control.

3. **HEAT TRANSFER, REFRIGERATION & AIRCONDITIONING:** Modes and mechanisms of heat transfer, conduction through plane and composite walls, cylinders and spheres, critical thickness of insulation, extended surfaces, natural and forced convection heat transfer, heat exchangers, radiation, vapour compression refrigeration systems, vapour absorption refrigeration systems, refrigerants and their properties, psychrometry and psychrometric processes, air conditioning and load calculation, effective temperature and human comfort.

4. **STRENGTH OF MATERIALS:** Stress and strain, thermal stresses, elastic constants, shear force and bending moment diagrams, principal planes and stresses, Mohr's circle, theories of failures, shear and bending stresses, deflection of beams, torsion of shafts, columns and struts, strain energy.

5. **DESIGN OF MACHINE ELEMENTS:** Engineering materials and their properties, heat treatment, factor of safety, stress concentration, fatigue failure, design of machine elements such as cotter and knuckle joints, bolts, riveted joints, welded joints, shafts, keys, couplings and gears, design of journal bearings, selection of antifriction bearings, design of thick and thin cylinders, springs and levers.

6. **THEORY OF MACHINES:** Kinematics links, pairs, chains and mechanisms, inversions of four bar, single and double slider crank chains, straight line and steering gear mechanisms, gear and gear trains, belt, rope and chain drive, clutches and brakes, cams and followers, flywheel and governors, gyroscope, balancing of

rotating and reciprocating masses, free and forced vibrations of single degree of freedom systems, critical speed of shafts.

7. **FLUID MECHANICS AND MACHINES:** Fluid properties, fluid statics, manometry, buoyancy, control-volume analysis of mass, momentum and energy; differential equations of continuity and momentum; Bernoulli's equation, Flow measurement: orifice & mouthpieces, pitot tube and venturi meter, viscous flow of incompressible fluids, flow through pipes, head losses in pipes and bends, hydraulic turbines, velocity triangles, power and efficiency, reciprocating and centrifugal pumps, performance characteristics of hydraulic machines, unit and specific quantities.

8. **PRODUCTION ENGINEERING:** Principle of working and equipments for welding processes, foundry and casting processes, hot & cold rolling, forging, drawing and extrusion, metal forming, theory of metal cutting, non-conventional machining methods, basic machine tools: lathe, shaper, drilling, milling, planer, grinder, jigs and fixtures, limits, fits and tolerances, linear and angular measurement, NC, CNC and DNC machines, CIM and FMS systems.

   Types of organizations, principles and functions of management, production planning and control, just-in-time and lean operation systems, project management and supply chain management, industrial occupational health and safety and related acts, Factory and boiler act, Labour acts.
   Control chart for variables and attributes, acceptance sampling plans, introduction to ISO 9000 and ISO 14000, reliability availability and maintainability, linear programming, inventory control, queueing theory.

9. **METALLURGICAL ENGINEERING:**

   Iron-carbon phase diagram, effect of alloying elements, classification of steels and their compositions, heat treatment of steels, strengthening mechanisms in structural steels, structure-property relationships in ferrite-pearlite steels, effect of grain size and inclusions on properties.

   Testing of materials for hardness, strength, toughness, fatigue, creep etc., standard specification for welded boiler steels, properties requirement for boiler steels, and weldability of materials, non-destructive testing for various welds and joints: Liquid penetrant testing, magnetic particle testing, radiographic testing, ultrasonic testing etc. fatigue, creep, high temperature cycle impact/abrasion testing, corrosion and wear test.

10. POWER PLANT ENGINEERING: Basic idea of thermal, gas, hydroelectric and nuclear power plants, Carnot, Rankine, Modified Rankine, Reheat and regenerative cycles, classification and working of various low pressure and high-pressure steam generators (boilers), boiler mountings and accessories, types of fuel used, basis of fuel combustion, safety standards as per IBR Codes, steam turbines: Impulse and reaction turbines, velocity diagrams and thermodynamic analysis, compounding and governing of turbines.

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Scheme of Examination

Subject	No. of Questions	Total Marks	Examination Duration
Concerned Subject	150	150	2.30 hrs.

1. The competitive examination shall carry 150 marks and 150 questions of Multiple Choice Type questions.
2. There shall be one paper. Duration of Paper will be Two hours and Thirty Minutes.
3. Negative marking shall be applicable in the evaluation of answers. For every wrong answer one-third of the marks prescribed for that particular question shall be deducted.

   Explanation: - Wrong answer shall mean an incorrect answer or multiple answers.