RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR SCREENING TEST FOR THE POST OF

INSPECTOR OF FACTORIES & BOILERS

(FACTORIES & BOILERS DEPARTMENT)

1. THERMODYNAMICS: Thermodynamics 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 cycles.

2. STEAM POWER ENGINEERING: Carnot, Rankine, Modified Rankine, Reheat and Regenerative cycles. Classification and working of various low pressure and high pressure boilers. Boiler accessories and mountings. Safety standards as per IBR code. Steam Turbines: impulse and reaction turbines, velocity diagrams and thermodynamic analysis. Compounding and governing of turbines.

3. 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 system, Performance parameters and their analysis, Air pollution: causes and control.

4. 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 cycle, refrigerants and their properties. Psychrometry and psychrometric processes, Air conditioning and load calculation, Effective temperature and human comfort.

5. 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.

6. 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.

7. 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.

8. 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 andventurimeter. 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.

9. 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. Unconventional machining methods. Jigs and fixtures, NC, CNC and DNC machines. Limits, fits and tolerances. Statistical quality control: Control charts and sampling plans.

10. INDUSTRIAL ENGINEERING: Types of organizations, Principles and function of management,Scientific management. Production planning and control. Work study. Break even analysis and inventory control. CPM and PERT.Job evaluation and merit rating. Wage payment systems and incentive schemes. Industrial occupational health &safety and related acts. Factory and boiler act. Labour acts.

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Pattern of Question Papers:

1. Objective Type Paper
2. Maximum Marks : 100
3. Number of Questions : 100
4. Duration of Paper : Two Hours
5. All Questions carry equal marks
6. There will be Negative Marking

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