

SYLLABUS FOR WRITTEN EXAMINATION OF LAB TECHNICIAN IN MECHANICAL ENGINEERING, SIST CHISOPANI

Theory of Machines and Machine Design:

Concept of simple machine, four bar linkage and link motion; mechanism and its different inversions; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscopes. Design for static and dynamic loading, Failure theories, Design of gears, shafts, rolling and sliding contact bearings, springs, brakes and clutches; principles of the design of machine elements like riveted, bolted and welded joints.

Engineering Mechanics and Strength of Materials:

Equilibrium of Forces, Law of motion, Friction, Concepts of stress and strain, Elastic limit and elastic constants, Bending moments and shear force diagram, Stress in composite bars, Torsion of circular shafts, Thin cylinder pressure vessels.

Thermal Engineering and heat transfer:

Concept of heat and work, 1st Law of Thermodynamics, 2nd Law of Thermodynamics, Thermodynamic processes; Gas power cycle-Carnot, Otto, Diesel, Dual and Brayton cycle; IC Engine Performance; Vapour power cycle- Rankine cycle; Refrigeration cycles; Heat Transfer– Basic modes of heat transfer, One dimensional heat conduction; free and forced convective heat transfer; heat exchanger performance; radiative heat transfer.

Fluid Mechanics & Hydraulic Machine

Fluid Mechanics: - Fluid statics, properties; manometry; buoyancy, stability of floating bodies; Bernoulli's equation Measurement of Flow rate Basic Principles- Venturimeter, Pilot tube, Orifice meter flow through pipes, head losses in pipes; Hydraulic Turbines: Classifications, Principles; Centrifugal Pumps: Classifications, Principles, Performance.

Manufacturing Processes

Casting, Forming and Joining Processes: - Design of patterns, moulds and cores, Different types of castings, solidification and cooling, riser & gating design; fundamentals of hot and cold working processes; metal forming processes like drawing, rolling, forging, extrusion, deep drawing, shearing, bending; Principles of welding, Arc Welding, Gas Welding, Resistance Welding, Special Welding Techniques i.e. TIG, MIG, etc. soldering & adhesive bonding.

Machining & Machine Tool Operations: -Basic machine tools, Mechanics of machining, single and multi-point cutting tools, tool life and wear, tool geometry and materials; Metal cutting principles, Basic Principles of machining with (i) Lathe (ii) Milling (iii) Drilling (iv) Shaping (v) Grinding Machines, principles of work holding; principles of non-traditional machining processes; design of jigs and fixtures; Computer Integrated Manufacturing - Concepts of CAD/CAM and their integration tools.

Engineering Materials

Classification of Steels: - mild steel & alloy steel, Heat treatment of steel, Phase diagrams, structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.

Metrology and Inspection: - Linear and angular measurements, Limits, fits and tolerances & comparators; gauge design, interferometry, alignment and testing methods, form and finish measurement, tolerance analysis in manufacturing and assembly.